The touch is the same as that of the fibroid; the cervix moves in bimanual palpation; the general impression is in every way the same. Examination under ether gives the same results. The uterine sound shows a normal depth, and proves no enlargement of the uterine body — a fact consistent with subperitoneal fibroids. Exploration shows double dermoid cysts (vol. 62, p. 159). A child of sixteen has evidently a large ovarian cyst (vol. lxi, p. 180) which proves to be malignant at its base and everywhere infiltrating. A woman of forty-nine (vol. 63, p. 105) has a uterine tumor which is correctly diagnosticated as uterine fibroid, but which under anesthesia proves so fluctuating as to raise the question of pregnancy; which, held in both hands, cannot be differentiated from a pregnant uterus; which proves to be, as the office examination seemed to show, a soft uterine fibroid. The most experienced expert in obstetrical practice is unable to rule out pregnancy.

A woman of forty-nine (vol. lvii, p. 126) has under intelligent observation for several years a multiple uterine fibroid, which proves on extirpation to be large round-celled sarcoma (Dr. W. F. Whitney) and to which the patient succumbs by extensive metastasis.

A woman of fifty-four has persistently recurring uterine flow (vol. 53, p. 119), to the investigation of which the attending physician is opposed as absolutely unnecessary, curettement having been done without ether. Thorough investigation shows adenocarcinoma of the uterine body in its very beginning. Vaginal hysterectomy has undoubtedly extirpated the neoplasm for good.

In a woman of thirty (vol. 63, p. 101) the evidence of malignancy was apparently incontrovertible. Curettage and examination of the scrapings by Dr. W. F. Whitney had shown malignant adenoma. In this case the patient's condition and age excited a doubt in my mind; I was unwilling to extirpate the uterus without further study. I therefore myself curetted, and sent, independently, the scrapings to Dr. Whitney, who pronounced them normal mucosa. There is in this case somewhere an error which must be cleared up before sacrificing the uterus of a young wife who desires, above all things, children.

That errors other than those of observation must be taken into account, Dr. Whitney himself would be first to admit. In a recent case (vol. 62, p. 131) of tumor of the upper jaw Dr. Whitney reported that the growth did not look in general malignant. The tumor was so evidently sarcomatous, malignant, hopeless, that Drs. Homans and Garland agreed with me in abandoning all attempts at removing the masses from the ethmoid and sphenoid sinuses. There was here some error either of misplacement, substitution, or actual loss of the specimen — errors which must always be taken into account — for the disease is now unmistakably malignant.

Whatever the future may bring forth in the treatment of malignant disease, the past has given us at best a very discouraging prognosis, even with the best and most thorough surgical

treatment. I cannot but think, however, that even with present methods the outlook is much less discouraging than it has been. We hear more of the unsuccessful than of the successful cases. Many of us, for one reason or another, have not followed up our cases. The things which, I think, are tending toward better results are the wide dissemination among the laymen of the importance of referring all bunches to the physician, the realization on the part of the physician that neoplasms are not to be lightly dismissed with a word of encouragement to apprehensive patients; and finally, the admission on the part of the surgeon that his diagnosis is fallible.

These things tend to bring all neoplasms early to the surgeon. Let him look upon every neoplasm, no matter how innocent it may appear, as a possible nidus of malignancy, and let him treat it on the principle that it is malignant until proved benign; and finally, let him, in his methods of extirpation, whatever his belief may be, act at least upon the theory that malignant disease is in the beginning a local affection.

The failure of the patient to consult the physician early; the delay of the physician to recommend the surgeon; the surgeon's late recognition of malignancy; the surgeon's half-hearted operation, — these sources of failure will be, to some extent at least, done away with. Instead there will be early resort to the knife, with a faith on the part of the operator that the broadest practicable dissection of a neoplasm means total extirpation of the disease and permanent cure.

Hopeful as we all are of an easy and effectual destruction of malignant disease without resort to surgery, I for one do not believe that so great a boon to humanity is in store for us. I have seen too many dismal failures follow loudly heralded methods of cure, whether of tubercular or of malignant disease. Not that there may not be made at any time some discovery the wonders of which will surpass the imagination, — like the x-ray, for example, — but in our hopelessness of such a splendid achievement we must not lose faith in our present methods, which, uncertain and discouraging as they are, have, I believe, possibilities of brilliant success.

OBSERVATIONS ON EXPERIMENTAL INCISIONS THROUGH THE ABDOMINAL WALL OF CATS.

BY FRED T. MURPHY, M.D., BOSTON.

From the Laboratory of Surgical Pathology of the Harvard Medical School.

This study of experimental incisions through the abdominal wall of cats has been carried out in the hope that by emphasizing certain histological changes which occur in the process of repair definite and positive reasons may be given why one method of closure of human abdominal wounds practically is to be preferred to another.

The methods which have been proposed and used in the closure of incisions through the abdominal wall are almost without number.

Putting aside technical differences these methods may be divided into two groups — closure *en masse* by through-and-through sutures including the skin, fasciæ, muscle and peritoneum, or closure in layers with careful approximation of fascia to fascia. Some of the modifications of these main types will be discussed later.

Much has been written from a clinical standpoint in support and in condemnation of each method.

Clinical results are the final test by which a surgical procedure must be judged, but as is well recognized the interpretation of such results not infrequently may be materially influenced by the personal view point of the observer. The skill of the individual operator, the general and local condition of the patient, the relative degree of absolute asepsis and hemostasis are all factors which effect the process of healing, though the wound may be said clinically to unite *per primam*. The amount of strain exerted on the scar after the operation is also an important factor in the end result. Therefore it may fairly be said, I think, that the clinical results from different methods of closure of human abdominal wounds are subject to such modifying influences that the interpretation of the success of the different methods is most difficult, and conclusions drawn from them may be misleading.

This much has been said in introduction in order to explain the various conflicting opinions and conclusions regarding the results of the closure of abdominal incisions by different methods which have been published by different surgeons.

In the following experiments only wounds which healed by first intention were examined, and any deduction which may be drawn applies, therefore, only to clinical wounds uniting *per primam*. Thus asepsis and proper rest during the process of repair are taken for granted.

The histological study of experimental wounds has established certain fundamental facts which are relevant to this problem. These facts are as follows:¹

In every wound the immediate result of the injury is the destruction of tissue. This destruction of tissue is followed immediately by the formation of exudation at the point of injury. In aseptic wounds the amount of exudate is proportional to the amount of injury.

The space between the edges of the wound is rapidly filled with an exudate composed of leucocytes, serum and fibrin, with some red blood corpuscles, the number of the latter depending chiefly on the amount of hemorrhage. Therefore, the greater the defect or the greater the amount of exudate the more space there is to be filled by granulation tissue, which in turn must be organized and changed into connective tissue.

The adjacent blood vessels are dilated and the exudate extends laterally for a considerable distance into the adjacent tissues beyond the line of the incision. It follows, then, that in the process of repair the new scar tissue extends also

for a considerable distance laterally from the line of incision.

The weight-bearing part of the scar in wounds of the abdominal wall arises practically entirely from the connective tissue. This connective tissue arises by proliferation from two main sources, — the fasciæ and the intermuscular connective tissue fibers. The connective tissue formed by proliferation from the fasciæ has in a general way the same characteristic as that tissue arising from the peritendineum. The proliferation of new tissue from the fasciæ is very rapid and the blood vessels disappear early. Even the young connective tissue is dense, the intercellular fibrillæ are marked and the cells early become flattened. That formed from the intermuscular fibers is relatively slow in proliferation, the young cells retain an oval or polygonal form longer, and the rich granulation tissue is slow to disappear.

Accepting these general principles and applying them to the wounds in question, it is essential, then, that in order to obtain the most favorable theoretical results, that there be careful approximation of the layers of fasciæ and that there be as little injury to the tissue as possible, thereby keeping at a minimum the amount of exudate and infiltration.

For the purpose of histological study it is much easier to follow the line of incision and to interpret the findings where a single muscle with distinct layers of fasciæ is involved. Therefore, in these experimental incisions, incisions about two inches long were made as a routine through the belly, of the rectus muscle parallel with the fibers. Large cats were the animals used. Ether was used as an anesthetic and the animals were killed painlessly. The surgical technique was as carefully guarded as in operations on the human being. No wound was studied which did not unite by first intention. The time of examination was two and four weeks after the operation. In some animals the wounds were

FIG. 1. Diagrammatic. To represent an incision through the abdominal wall closed with careful approximation of each layer.

closed *en masse* with through-and-through sutures of silkworm gut; in others in layers with absorbable and non-absorbable material with careful approximation of the fasciæ. In another series the wounds were closed in layers overlapping the external rectus fasciæ. Also in certain other wounds certain combinations of the two methods were tried, such as the placing of deep sutures of silkworm gut with suture of the fasciæ in layers, or the combination of through-and-through,

¹ Dr. Nichols: Syllabus of Surgical Pathology.

silkworm gut sutures with a deep buried stitch including all the layers except the skin. The abdominal wall of a cat is relatively so thin that this combination of suture in layers with a through-and-through suture, designed primarily to prevent the accumulation of fluid in thick abdominal walls, had really no marked effect in the process of repair.

If an incision of the abdominal wall, closed in layers, be represented diagrammatically by Fig. 1, the tendency of the sutures placed *en masse* was to allow an arrangement which may be represented by Fig. 2.

FIG. 2. Diagrammatic. To represent an incision through the abdominal wall closed *en masse*. Note the retraction of the end of the layers of fascia.

That is, the external and internal layers of the rectus sheath tended to retract, and although the muscle bundles were approximated the essentially strong tissue arising from the fascia had to fill up an unnecessarily big defect, thereby increasing and weakening the scar, and at the same time prolonging the process of repair; or the arrangement of the layers was so confused that it was impossible to follow out any definite layers in the process of repair. That is, the new connective tissue of the intermuscular fibers blended in a mass with that derived from the dense fascia. Exceptionally, the layers of fascia had not retracted and the edges were held in apposition with the suture *en masse*, and the process of repair was as satisfactory as theoretically could be desired.

Suture in layers gave universally a more satisfactory and stronger looking wound histologically. The strong fibrillar connective tissue derived from the fascia on the one side blended with a like layer from the opposite side, giving a dense scar which at two weeks was, from histological appearances, as strong or stronger than the new tissue arising from the intermuscular bundles at four weeks. This difference between the new connective tissue formed by proliferation of the fascia and that formed by proliferation from the intermuscular fibers may be seen by comparing Figs. 3 and 4.

The strength of the scar resulting from these two methods of suture was tested by an actual pull. The wounds sutured in layers were the stronger at two weeks, but so many modifying influences came into consideration that these results could be considered only as supporting the general impression derived from the histological picture and could not fairly be interpreted in actual pounds.

The omentum was adherent to an equal degree in both methods of closure.

The startling effect of trauma is graphically illustrated by comparing Figs. 5 and 6. In Fig. 5 the incision was closed with through-and-through sutures of silkworm gut without any trauma whatever, except that necessary in making the incision and placing the sutures. The muscle on either side of the incision will be seen to show practically no infiltration, with small round cells or degeneration of the muscle fiber.

Fig. 6 shows the result of trauma of the edges of the wound. This trauma was not severe or lacerating, but such as might readily be sustained by any abdominal wall during the course of an operation in which hemostats were applied carelessly and forcible retraction was used.

The infiltration extends several centimeters to either side of the line of incision. As is shown in Fig. 7, the muscle bundles far away from the line of incision are degenerating at the end of two weeks. This degeneration beyond the line of incision means, of course, an unnecessarily wide extent of scar tissue, and as scar tissue is weaker than the normal a weak abdominal wound. These wounds which had been bruised by violent manipulation were pulled apart with much less force than that required to rupture those closed with through-and-through sutures, or in layers in which care had been taken to prevent injury to the edge of the wound.

Relative to the overlapping of the layers of fascia it was demonstrated that these overlapped layers persisted and preserved their identity at the end of four weeks; that is, the layers of dense fascia could be followed in the microscopic section, and they had not blended in the mass of newly formed scar tissue.

With this overlapping technique, accurate closure of the dead space is assured as the overlap takes up any possible slack in the fascia, thereby bringing the muscles into close apposition. It also affords a greater surface for the strong fibrillar connective tissue and theoretically should give the strongest possible union between the layers of fascia.

A study of specimens in which the incision has been made at right angles to the muscle fibers demonstrated the fact that with accurate approximation of the fascia and with supporting suture to prevent the retraction of the muscle the union was as satisfactory histologically as in the cases in which the muscle fibers had been split.

It was not possible to obtain a satisfactory histological specimen from an incision in which the so-called gridiron or muscle-splitting operation of McBurney had been done, because the microscopical section would not cover the lines of the various muscle incisions. Therefore, any opinion regarding this procedure must be based on purely theoretical grounds. In order to make the incision and control the pull of the various muscle planes the force used must of necessity be greater than with the simple straight incision. Having seen the effect of trauma on the muscle adjacent to the line of incision, it is impossible on histological grounds to think of the final

repair in this gridiron incision as being anything else than a plug of scar tissue of greater or less extent, in the center of the wound, provided the edges of the muscles have been roughly handled. This may be represented diagrammatically by Fig. 8.

FIG. 8. Diagrammatic. The heavy lines represent the incisions through the abdominal muscles in the muscle-splitting operation. The lighter lines represent the extent of the degeneration of the muscles after rough handling. The dotted circle represents the resulting plug of scar tissue.

Imperfect sterilization of suture material used in buried stitches has been one of the chief reasons advanced for the condemnation of the layer suture, but with the improved methods for the preparation of absorbable material, this does not seem longer to be a valid objection. As was stated in the beginning, practical results must decide finally the merit of any surgical technique, and the exigencies of the individual case may warrant any modification of a technical procedure.

Judged from a histological study the suture

tion as far as possible of all dead space. This method is represented diagrammatically by Fig. 9.

Violent manipulation of the edges of an abdominal incision should be avoided with the same care as has been recognized as essential to good results in the handling of the intestines or stomach.

ON THE PROPER INSPECTION OF IMMIGRANTS AND SCHOOL CHILDREN IN REGARD TO THE OCCURRENCE OF TRACHOMA.

BY HASKET DERRY, M.D.,

Consulting Surgeon to the Massachusetts Charitable Eye and Ear Infirmary and the Carney Hospital.

A GIRL of fifteen, from a New England city, had been excluded from a public school for five months, by order of the local board of health. The examination of the eyes, conducted by an agent of the board, resulted in a diagnosis of trachoma. The question now arising whether she were sufficiently recovered to return to school without injury to the other scholars, she came to Boston to consult a colleague. He found a normal state of things, decided that she might safely return, and sent her to me for confirmation of his diagnosis.

I entirely agreed with him, and added to the report a clause that the present absolutely normal condition of the eyes precluded the existence of a trachoma extending over five months. In other words that the diagnosis had been a mistaken one, and the child forced to pass the five months in entirely unnecessary idleness.

Several similar cases have recently occurred in my own practice, one being that of a working girl who had been denied an opportunity of earn-

FIG. 9. Diagrammatic. To represent an abdominal incision closed in layers, and with a deep supporting stitch.

ing her living on the ground that she had trachoma, the diagnosis being in this case made by a physician attached to a general hospital. Both eyes were entirely normal, had undergone no organic change, showed no trace of disease, and had evidently never been the seat of granular conjunctivitis. She at once resumed work. A colleague, well versed in ophthalmic surgery, sends me the following:

"In reply to your question concerning trachoma in immigrants, I would say that on April 9, 1902, I was asked by a medical friend to see a