Summary.

As a result of these investigations it would seem justifiable to draw the following conclusions:

1. The acetic anhydride-sulphuric acid test on the cerebro-spinal fluid of cases of general paresis is positive in almost every case (97 per cent.), and hence is almost as reliable as the Wassermann reaction in this condition.
2. It is negative in almost every other type of mental disorder except certain cases of neuro-syphilis (other than general paralysis of the insane).
3. It is a test which can be performed with great ease and rapidity and hence is of definite value to the clinician.

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² Grossman: *Journ. of Mental Science*, vol. xxi, p. 439.

ON THE SOMATIC ORIGIN OF MALIGNANT DISEASE.

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THE view of malignant disease here presented is simple, congruous, as it seems to me, with ordinary pathology and ordinary clinical medicine, reconciles easily and naturally the discordant and puzzling results of recent experiment, and, if true, removes most of the obscurity and mystery from the malignant process.

Malignancy and Hyperplastic Inflammation.

Clinicians have long held the opinion that continued irritation will induce cancer. This opinion has been confirmed by exact observation on the effect of various irritants, especially the extracts of tar; by these, as is well known, the disease has been brought on in mice by direct experiment. Now the chief reaction of the body to a chronic irritant is a proliferation of connective tissue and epithelium. This process is commonly called chronic inflammation; it is well seen in the chronic mastitis which so often precedes carcinoma of the breast. Sir Lenthal Cheate objects to the term "inflammation" as a description of this process; it differs, indeed, in degree and partly in kind from acute inflammation, but resembles it in being a reaction to mild, as the other to intense, irritation; and, like the acute kind, seems to be essentially a vascular and lymphatic reaction, though in acute inflammation the vascular changes prevail, and in chronic inflammation the lymphatic.

Sir Lenthal Cheate's accurate and careful observations¹ seem to show that this process of hyperplasia may pass almost imperceptibly into an innocent or malignant tumour. He has shown specimens where in a single breast chronic mastitis has developed into fibro-adenoma and different varieties of carcinoma. Dr. Archibald Leitch's experiments on guinea-pigs² lead to the same conclusion. He was able to produce malignant growth in the gall bladder of the guinea-pig, a refractory animal, by means of gall stones, or even sterile pebbles, aseptically introduced. He, too, is quite sure that there is no clear dividing line between carcinoma and simple hyperplasia. "We have," he says, "no means of determining when the heterotopy and irregular growth of the tubular epithelium ceases to be translatable as simple hyperplasia and assumes the definite characters of malignant neoplasia . . . the process is so gradual and the dividing line so imperceptible."

Malignancy not a Property of the Tumour but a Reaction of the Body.

It seems most improbable, as Dr. Leitch remarks, that any toxic agent should have arrived from elsewhere to change so utterly the nature of the growth yet change its habit and appearance hardly at all; nor could any such

agent have been introduced under the conditions of the experiments, nor probably have been present originally in the gall bladder. I would suggest that the malignant alteration is most simply explained if we suppose that the tumour, or hyperplasia of epithelium, does in fact remain unchanged; that the change from innocency to malignancy consists wholly in an altered reaction of the body. At some moment, we will say, the body becomes aware of this mass of cells, regards it as a living intruder, and attacks it with leucocytes and cytolytins. If the epithelial cells are finally surrounded by fibrous tissue the tumour is "innocent"; it is thenceforth disregarded as a foreign body. But if this encirclement fails, the growth is "malignant"; the malignancy, however, is not in the tumour. There is a fatal difference between this and an invading microbe; the tumour is not foreign to the body, but part of it; the cytolytins which are lethal to the tumour cells are lethal also to the cells of the body. Hence the zone of destruction at the periphery of a malignant growth, the corrosion of muscles and blood vessels and nerves; hence also the fretting of the tumour's surface, the metastases, and general cachexia; all this destruction is wrought, if my view is true, not by the juices of the tumour, but by the juices of the body. It is probable that a vicious circle begins, that the tumour cells which are not destroyed are irritated to more rapid growth, and the body thus stimulated to fiercer efforts; however this may be, the whole malignant process seems in this manner quite easily explained.

Practical Tests.

From acceptance of this view it would follow that if the body could be induced to ignore the tumour the whole malignant process would stop; but how to achieve this is not easy to see; the patient might be hypnotized, but hypnotic suggestion must be carried far to induce a leucocyte to slacken its activity; it seems unlikely that this method would succeed. Again, we might inject some chemical body like a vaccine, but of opposite effect, so that the activity of the body against a specific invader would be not stimulated but depressed. Such a chemical body may be invented in the future by bacteriologists. If the body in the part affected could be made anaesthetic by blocking its afferent nerves it seems possible, but not certain, according to this view, that the malignant process would be arrested or retarded. The reactions of inflammation are probably in large measure the result of chemiotaxis, and so would proceed though sensation were destroyed; still, the tumour would be unfelt and vaso-dilatation abolished. The feeble resistance offered by ataxic patients to perforating ulcer of the foot would seem to afford some hope that the malignant process might thus be checked.

I had arrived at this point when I learnt that this experiment had already been tried—deliberately on mice by Dr. Cramer, and by Nature on sundry patients whose cases are recorded by Sir Lenthal Cheate. Dr. Cramer³ painted a number of mice with an extract of tar, both on the normal skin and on a part deprived of its nervous connexions. Twelve of these mice developed malignant tumours, and it is noteworthy that in every single case the normal skin was so affected. In five mice malignant growth arose also in the denervated area, but so late, in three of these, that it seems almost certain that the nerves of the part had regenerated themselves before growth began. Thus, in all but two of the mice malignant growth was inhibited by the loss of nerves; moreover, in one of these two exceptions the growth of the tumour was slow and malignancy but slight.

It must be admitted that these experiments do not go very far toward the proof of the case. It may be said that if, as seems likely, malignant disease is a reaction of the body cells to irritation, then that reaction might probably fail if the irritation could not be perceived. Nevertheless, with the old view of cancer, malignant proliferation might seem a reaction of cell protoplasm to a local stimulus rather than a reaction of the body as a whole to an irritant; once allow this, and we are fairly launched on the road to my conclusions. Now, Cramer's experiments, though not conclusive, do strongly suggest that malignant disease is a reaction of the body as a whole,

since the growth arises but rarely when the irritated part is first made anaesthetic.

The observations of Sir Lenthal Cheate¹ are more important, since they show the arrest of a malignant process already begun. In some eight of his cases the growth was checked in one direction when the nerve of that part was destroyed by deep malignant ulceration. Thus in one case a rodent ulcer, which had invaded the area of the supraorbital nerve, grew no more that way after destruction of the nerve trunk, though growing freely elsewhere. These cases seem decisive. The ulcers were in vigorous growth, their cells proliferating, and their supposed destructive juices in full activity. Yet these juices, which could destroy and digest normal cells, could not, apparently, destroy those adjacent cells which differed only in the loss of their nervous connexions. We must, therefore, suppose that malignancy is an attribute, not of the tumour, but of the body excited by the tumour.

Sarcoma.

It is probably safe to say that any surgeon at a large hospital sees fifty cases of carcinoma and epithelioma for one of sarcoma. Yet hyperplasia of connective tissue is exceedingly common, being present in every scar and regenerating wound and all chronic inflammation. It is always present, for example, in chronic mastitis. Yet this condition, so prolific of carcinoma, hardly ever gives rise to sarcoma. On these grounds alone it might have been predicted that for the production of sarcoma something more than simple irritation would be required; and recent research seems to show, or suggest, what this further condition may be.

Dr. A. Carrel² in his researches on the Rous sarcoma of fowls has shown that the virus of this tumour is carried in the large monocytes; further, that some of these cells, when treated with the virus, transform themselves into cells resembling agglutinated fibroblasts. When these diseased monocytes are introduced into a healthy fowl they form tumour cells and attract monocytes, which propagate the virus, and are likewise transformed into tumour cells.

Now in the first place these observations show that sarcoma grows in a very different manner from carcinoma, assuming that the Rous sarcoma is true to the type of its kind. For it seems to grow rather by the accretion of extrinsic cells than by the multiplication of the original cells of the tumour. For the rest, no interpretation but mine seems possible. That the virus is propagated by the body's defenders, the leucocytes, Dr. Carrel notes with wonder, but attempts no explanation. But in my view no explanation is needed, for all malignant disease is so produced. So again the specific poison, prepared by the white corpuscles to destroy their fellows, is equally injurious to themselves; they become part of the tumour, and in their turn are attacked by other leucocytes. All goes on exactly according to hypothesis: in a tumour so composed the phenomena might have been predicted. Only one difficulty remains: what condition initiates the tumour, since it seems that simple hyperplasia is insufficient? To find an answer to this, we are perhaps helped by the well known and still more recent work of Dr. Gye and Mr. Barnard.³ Their work is noteworthy chiefly because they claim to have discovered a living ultramicroscopic virus, which is present in the majority at least of the malignant tumours they have examined. Since, however, the characters of the tumour depend not on this but on another, probably chemical, "specific factor," it seems doubtful whether their "virus" can do more than predispose to cancer. Their experiments, as so far published, are obviously too incomplete to allow us to draw definite deductions from them; but if a surmise may be allowed, we may perhaps suppose that the "virus" is simply a cause of hyperplasia, and the "specific factor" the toxin of the leucocytes, which acts, as Carrel has demonstrated, to generate the vicious circle. How a sarcoma commonly begins is doubtful; it may be that a blow, by injuring the fibroblasts in a simple hyperplasia, will lead to an attack on this group of cells, as a foreign body, by the leucocytes.

Summary.

My conclusions may be summarized as follows:

1. Malignancy is not a property of cancerous tumours, but a suicidal reaction of the body to an innocent hyperplasia.
2. The reaction is suicidal because the hyperplastic cells are really part of the body, and the specific poisons generated to destroy the tumour are almost equally poisonous to the body at large.
3. Sarcoma probably differs in its nature from carcinoma; here the diseased process seems more complex, but the essential nature of malignancy is probably the same.
4. It follows that if the body can be led to disregard the tumour the malignant process will stop, and the patient will be cured, save that the original hyperplasia will remain.
5. It seems possible that this result may be achieved by blocking the afferent nerves of the part.

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RECTUS TRANSPLANTATION IN THE TREATMENT OF VENTRAL HERNIAE.

BY

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THE difficulties of obtaining a "radical cure" in large ventral herniae are well known, and from time to time various new principles have been suggested. Silver filigree, overlapping of tissues, lacing with fascial grafts, etc., have all given good results in suitable cases. There are objections, however, to all, and not one of them is suitable to all cases. Any alternative may be of value when other methods are not entirely satisfactory, and I venture to submit the method of shortening, overlapping, or transplanting the recti as a useful adjunct in the treatment of these cases.

The operation may be briefly described as follows: A transversely curved incision, convex downwards, about six inches long, is made just above the pubis, and the skin and fascia dissected upwards and downwards to expose the aponeurosis. The dissection is carried downwards to expose the anterior surface of the pubic bones and the symphysis. The recti muscles are detached from the pubes and can be shortened if required by making a tuck; they are then sutured to the symphysis, or can be overlapped and sutured with kangaroo tendon to the pubes after drilling holes in the bone. During this procedure the patient's shoulders should be raised so as to relax the muscles. In dealing with an umbilical hernia the sac would be exposed in the usual manner and the peritoneum sutured. The recti could then be overlapped and sutured through a pubic incision before closing the umbilical incision.

This method appears to be specially useful in mid-line herniae through scars below the umbilicus, though it would also be applicable to cases of divarication of the recti and some cases of umbilical herniae. The following case illustrates the method.

A widow, aged 57 was sent to me on April 9th, 1925, by Dr. C. H. Ross Carmichael. In 1903 she had been operated on for some gynaecological trouble by a mid-line infraumbilical incision. The wound healed normally, but about seventeen years later she noticed a swelling appearing in the scar.

In 1921 an operation was performed to cure the hernia; before she was discharged from hospital, however, a recurrence was noticed, and a second operation was performed. She "felt the lump coming back again not long afterwards," and a third attempt was made in 1922, but recurrence took place a few months later.

When I saw her the hernia was about the size of the foetal head and was hanging down over the symphysis pubis. The