doses is more useful in children) by hypodermic injection and a gargle of iced or cold water and adrenaline.

When the bleeding is from an artery it is often very difficult to stop. The first thing to do is to give the patient a full dose of morphine, and then to take immediate steps to stop the bleeding before the shock increases and severe secondary anaemia results. There are several methods in use, one of which requires no anaesthetic.

(a) *Method Requiring no Anaesthetic.*—This method, which has important advantages, consists in determining which tonsil-bed is bleeding and applying a "Colaum" tonsil clamp, after first turning out any blood-clot that may be present on that side. The clamp is uncomfortable for the first few minutes, but the discomfort soon wears off, especially if the preliminary and always essential dose of morphine has been given. The clamp is easy to apply and to remove, is secure when in position, and effectually stops the bleeding. It should be kept on for about twelve hours, and those should be hours of sleep induced by morphine and under careful supervision. Fluids can be swallowed with the clamp in position. When the clamp is applied, a rectal saline is useful to restore lost fluid.

(b) *Methods Requiring an Anaesthetic.*—(1) The method of choice is to find and tie the bleeding vessel, but while under the anaesthetic the vessel sometimes ceases to bleed, and is hard to find. A stimulating anaesthetic such as ether, or gas-oxygen-ether, is therefore indicated in these cases. (2) The tonsil-bed may be sewn up by stitching the pillars of the fauces together by deep sutures with Scott's or Irwin Moore's needles. The stitches should take in the floor of the tonsil-bed. This effectively stops the bleeding, but is not advisable except as a last resort, owing to the scarring of the faucial pillars which is liable to supervene, with a consequent "tight palate." (3) A small pad of gauze sewn into the affected tonsil-bed stops the bleeding, but if vomiting occurs the stitches often cut out, thus releasing the roll of gauze immediately, and causing the pillars to scar later on. The roll of gauze may be swallowed or even sucked into the larynx.

4. The Prevention of Secondary Haemorrhage.

Tonsils should never be removed when sepsis is present in the mouth owing to dental trouble or ulceration from other causes, nor, needless to say, when the tonsils are in a state of acute or subacute inflammation. As much care should be taken in preparation for this operation, both in adults and children, as for any other operation in the buccal cavity; and the patient should be put into as good a state of health as possible before its performance. After the operation the frequent use of a gargle of hydrogen peroxide is the most efficient preventive of trouble, because it clears away any necrotic material, which may harbour infection, far more effectively than any other disinfectant.

Secondary haemorrhage usually occurs from six to ten days after the operation. Every case in which it occurs should be kept under close supervision, since it may at any time become serious and need instant attention. In all cases the clot should be turned out and the tonsil-bed swabbed with an antiseptic solution. If serious it should be dealt with as if it were primary haemorrhage by the most suitable method for the occasion.

The Anaesthetic.

Gas or ethyl chloride may possibly be suitable when adenoids only are to be removed; but are the last methods to be adopted when tonsils are to be removed also. Their adoption is the most fertile cause of all the troubles associated with this operation—that is, incomplete removal of both tonsils and adenoids, the removal of the uvula and faucial pillars, pharyngeal tags, and unnecessary loss of blood both at the operation and after. The reason is that they allow insufficient time for a decent operation to be performed, and for the bleeding vessels to be found, clamped, and tied. It does not much matter what anaesthetic is used, provided that it can be fed into the open mouth through a tube sufficiently to keep the patient well under for as long as is necessary to complete the operation thoroughly and tie the vessels.

It is difficult to overestimate the immense amount of good that has been and is being done by the timely removal of hyperplastic and septic tonsils and adenoids both in

children and adults. So justly popular has this operation become that the number of patients has in many instances outrun the facilities for dealing with them properly. Although the percentage of incomplete removals, undue haemorrhages, and damaged tissues combined may not be more than 30, yet so many of these operations are performed that the actual number of comparative failures is very large.

In adenoid disease the maxim should be to remove the adenoids, all the adenoids, and nothing but the adenoids; and in the case of the tonsils to take out the tonsil, the whole tonsil, and nothing but the tonsil. In the latter case it is also essential to arrest all bleeding at the earliest possible moment by means of pressure forceps and ligature, and to perform the operation in a buccal cavity free from all sepsis but that of the tonsil itself.

The figures are from semidiagrammatic drawings made by the author from cases which have come under his observation.

SOME EXPERIENCES IN AND CONSIDERATIONS OF DEEP X-RAY THERAPY.*

BY

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It is only by the periodical publication of results by those who are practising deep x-ray therapy that the knowledge of the great value of this form of treatment in malignant and certain other conditions can be acquired by general practitioners and surgeons, who are brought primarily into closer contact with sufferers than is the radiologist. I have personally been using this treatment now for about eighteen months, and during that time have had certain very instructive cases. The interest taken in this form of therapy is now so steady—though in this country slow—that a review of some of the cases, and of the latest views held on the treatment, may be of interest.

Among non-malignant cases treated I will only refer to three of fibroids, in women aged 47, 48, and 42, and treated respectively eleven, sixteen, and twelve months ago. Each patient suffered from menorrhagia and metrorrhagia. In two of the cases the fibroids could be felt bimanually; in the other they were seen by a surgeon who operated for appendicitis four weeks before I treated her, but the patient was not in a condition to have them removed at the time of the operation. These three cases were severally treated by one application only each of deep therapy, and an artificial menopause induced with no more of the characteristic subjective symptoms than one sees at any ordinary climacteric. I know that the consensus of opinion among English gynaecologists is against this treatment—an opinion that is diametrically opposed to that held by the majority of practitioners in other countries. In France, Belgium, Germany, Austria, Italy, and largely in America, x-ray therapy—either in one deep massive dose or by divided weaker doses—is the treatment of choice in ordinary cases of fibromyomata, and surgery is only used when there are some definite symptoms—for example, pressure, or temperature, etc., suggesting the existence of some other condition or of degeneration. Where malignant changes are suspected deep therapy, if available, is the almost invariable rule. Those of us who have seen the comfort that is brought to patients suffering from prolonged climacteric menorrhagia or haemorrhage from fibroids—of course, if it be due to a polypus, surgical removal is required—are at a loss to understand the views held by gynaecologists in this country, especially if they have studied the records of the long series of successful cases published in Continental literature by such men as Bécclère, Wintz, Gauss, and others.

Of cases of malignant disease I have treated seven for prophylaxis after operation—principally mammary scirrhus; of these there is nothing to be said—there are no recurrences, but of course the time is too short.

Among the patients treated for actually existing malignant disease there have been several of great interest; all

* Abstract of a communication read before the Gloucestershire Branch of the British Medical Association, January, 1924.

of them were inoperable cases. It is almost unnecessary to state that when a malignant disease has reached the inoperable stage there is every probability that metastatic growths have started elsewhere, and that the biological factor of the body is failing or has failed. Therefore, in such cases as these, one must gauge the efficacy, and the possibility of future developments of the treatment, not only by whether the patient is cured, but whether the progress of the malady in the part treated is inhibited in a way that experience shows not to occur in cases not so treated. If this takes place one has gone a long way towards proving that these rays will effectually destroy malignant tissue.

I. A case of inoperable supraclavicular growth occurring eight years after removal of the breast for scirrhus. There was intense pain. Two treatments practically relieved the pain entirely, and the mass diminished, but the patient died ten months later of secondary deposits in the brain.

II. A doctor, aged 54, who had a large inoperable mass below the ear, secondary to an epithelioma of the jaw, treated in London by radium a year previously. He had great pain and constant salivation. One treatment completely stopped the pain and salivation, for though I only treated the patient that once in May, 1923, I received a letter three weeks later saying the "patient is better in health and spirits. The salivation is nil, and he took solid food yesterday—the first for months. The pain has disappeared." Early in July I received a report that this satisfactory condition continued; but on August 1st I had a letter stating that "after six quiet painless weeks, resting in his garden with his children playing round him, he passed quietly away."

Considering the hopelessness of the case from the start, the relief of the patient's distressing symptoms from a single treatment was, I think, very remarkable.

III. In three cases of inoperable cancer of the cervix pain and haemorrhagic offensive discharge were very marked symptoms. There was a fungating cervix to be felt by the examining finger, and in one patient there was a large ulcer behind the cervix in Douglas's pouch. In each of these cases the discharge and pain have ceased, the ulceration, where present, has healed up, and the fungation disappeared. One of the patients—she who had the large ulcer—was unable to walk a quarter of a mile. To-day, eight months after the first application, she can walk five or six miles, has put on weight from 8 st. 4 lb. to 9 st. 12 lb., and has no pain or discharge.

These have been the most satisfactory of any, and this experience bears out what has been proved at Erlangen and elsewhere. As I mentioned two years ago, in the Wertheim Klinik in Vienna operations on malignant disease of the cervix and uterus have been largely given up in favour of deep therapy. Of course, it is too soon yet to speak of "cures," but, considering how very unsatisfactory the general results of surgery are in these cases, and that Continental statistics prove that the chances to the patient are far better from deep radiotherapy than from operation, I think one may fairly claim that in most cases of carcinoma of the cervix and uterus deep x-ray therapy is to be preferred to surgical interference.

It would require too much space to go into details of the other cases. Some were failures, either because the disease was too far advanced when treated or insufficient treatment only was possible. I feel that, where the cases have been suitable, the results have been most encouraging, and one has definite proof of the power of these specially generated rays to alleviate pain and to destroy malignant cells.

The position as regards deep x-ray therapy in this country to-day is that it is growing slowly. I have written to the various makers, and as far as I can ascertain there are about 50 sets designed for deep therapy in the whole of the British Isles.

As far as France is concerned, Gaiffe Gallot et Pilon tell me they have made 130 sets, and they believe that about 20 have been made by other manufacturers—say, 150 in all. Reiniger Gebbert and Schall and the Weifa Werke Co. of Frankfort inform me that between them they have made 990 sets of apparatus for deep therapy, of which 460 are in Germany and the remainder scattered over the rest of the world—thus there are about 100 in Spain, 80 in Italy, 80 in Holland, 20 in Austria, nearly 200 in the Argentine and Brazil, and so on. I have not the figures from Siemens and Halske, but their output is considerable, and there are a large number in the United States to my knowledge.

Considering the initial cost of the apparatus and the expense of working, two facts stand out from these statistics: (1) that the medical world at large considers as proved the value of this treatment in malignant disease; (2) that we in this country are behind the rest of the world in studying and using it.

For a long time it has been recognized that even x rays from an ordinary apparatus will destroy malignant cells if they can reach them in sufficient quantities. Surgeons acknowledge this when they submit patients, after a mammary scirrhus operation, to radiation, and find the ultimate results better than without raying. This means that they realize that a certain number of malignant cells may have been set free during the operation, or that some are present in the tissues not removed, and that these can be destroyed. If radiation can destroy isolated malignant cells when superficial, it can also destroy them when occurring *en masse*, provided we can get such a radiation as is able to reach the growth in sufficient quantities and of the proper wave-length. This so-called deep therapy merely consists in a development and improvement of the older technique—a development because it is now possible to produce and maintain a much harder or more penetrating ray, and one which also sets free quantities of secondary radiations, which the rays from ordinary apparatus cannot do; and an improvement in that the tubes can be calibrated, so that we know the exact quantity of rays absorbed at any given depth below the surface, and, as we also know the lethal dose of such rays for the malignant and other cells, we can, by calculation, determine how to get the necessary dose at the depth of the tumour in the body. The old method is haphazard and unscientific. We know the skin dose by the change in colour of a pastille, but we have no idea of how much of that dose is absorbed at different depths below the skin.

Professor Wintz of Erlangen has enabled us to substitute accuracy for inaccuracy, and, further, he has worked out what is the amount of radiation required to kill the cells of carcinoma, sarcoma, etc. But, as he has carefully demonstrated, though such a dose may be the "lethal" dose to the tumour, it does not always follow that it is the "curative" dose to the patient. Many factors beside that of the irradiation must be considered. First and foremost there must be the same amount of care taken in the preparation and after-treatment of a patient as there would be for a surgical operation. These treatments cause severe constitutional effects, and are not like the simple treatments to which we have been accustomed with the ordinary type of apparatus.

Wintz has made an interesting series of observations on 326 cases which were apparently more or less similar as far as their pathological condition was concerned, but which could be divided into two classes:

(1) Those who had decent homes, good nourishment, and efficient after-care.

(2) Those who had to struggle for their daily bread, had to face poverty and anxiety, and could not give themselves proper attention.

After 4 years there were 26% more of (1) than (2) living.

"	3	"	"	22.5%	"	"	"	"
"	2	"	"	23.5%	"	"	"	"

This shows the great importance of after-care, and the necessity of repairing the damage to the blood caused by the rays in order that the products of cell destruction may be efficiently dealt with, and the process of replacement of the destroyed tissue properly carried out.

All my cases have been treated by the technique and with the same apparatus as is used at Erlangen. I do not at present see any reason to change either.

Short of an expected "cure," what will the treatment do? One of its most striking results is the relief of pain. As pain is almost invariably due to pressure, and, in the case of malignant disease, may be traced either to the direct pressure of the tumours on nerves or to secondary neuritis, the partial or complete destruction of the malignant cells, causing a diminution in size of the mass, relieves the pressure. Holzknecht of Vienna has shown that leucocytes are, of all structures, the most rapidly destroyed by penetrating rays; where, therefore, there is leucocyte

exudation and consequent pressure, this will be relieved. It is this action that explains the relief brought about by radiation of the appropriate nerve roots in cases of sciatica or other neuritis, and also that latest treatment of nephritis where the use of deep rays has had the same result as a decapsulation, by destroying the leucocytes and so relieving the pressure.

From the patient's point of view the actual treatment is entirely free from pain or other sensation. Naturally a weariness is induced from remaining for the required time in one position. Prolonged exposures to the thorax and upper abdomen cause a varying degree of vomiting, which rarely lasts more than twenty-four hours. Careful preparation, the administration of chloretone, and the use of "drop enemata" of saline solution usually relieve the symptom in a short time. For some days after the treatment patients may experience a certain amount of malaise, but this does not occur in the majority. If the exposures have been correct the skin shows nothing but an erythema and a subsequent bronzing. If there be irritation it can be relieved by ointments.

There is still much to learn, and if we are to learn there must be more co-operation between the different branches of our profession in the treatment of cancer. Such treatment—as also that of fibromyomata—is to-day no longer purely surgical, and the patient has a right to expect that every means that can alleviate or cure him should be called into requisition where available. A surgeon remarked that a radiologist ought also to be a surgeon. In my opinion the boot is on the other leg. Every radiologist has learnt some surgery, and has seen more or less of it in the ordinary course of his work. The surgeon of to-day—at any rate those in middle life—never learnt anything of radiology beyond a certain acquaintance with the reading of x-ray pictures. It is they who have to study the developments and potentialities of the science of modern radiotherapy, and to know when to advise it; and they have far more to learn in this, the youngest of the healing arts, than the radiologist has to learn of the art of surgery; its results in the treatment of malignant disease have not kept pace with the advances in other departments of their art.

A HALOMETER.

BY

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WE have been steadily learning that it is important to be able to ascertain with some degree of accuracy the angular measurement of the halos or coloured rings of which patients from time to time complain; for it is becoming clear that by this means we have an important aid to differential diagnosis.

Inasmuch as the so-called physiological halos (those produced by the histological peculiarities of the lens structure) may be taken as practically constant at 7° , whilst the true glaucoma halos vary from time to time even in the same patient, and have a range (in my experience) of from 7° or less up to nearly 12° , it is obviously important that we should have some ready means of measuring all such halos quickly and accurately. The method with a candle, a cardboard strip, and a pencil is clumsy and unsatisfactory. The device of having two points of light at a fixed distance showing through a metal disc—(1) a large one for the creation of the halo, and (2) a small one whereby any particular ring can be located—has this great disadvantage, that the smaller light aperture itself gives rise to halos and so may greatly confuse the patient; it is also a clumsy expedient at the best to be constantly altering the observation distance. The instrument now about to be described does away with these difficulties and makes the measurement of a halo a quick, simple, and easy procedure which barely takes a minute to carry out, and which needs no mathematical knowledge whatever. The halometer, as I have called it, has been made for me by Mr. Clement Clarke, of 16, Wigmore Street, and I am much indebted to him for the trouble and ingenuity he has put into it.

Description of Apparatus.

A circular wooden base (B), for fitting to the wall, carries a base box (BB) to which are affixed twin aluminium bars (A and AA). This box revolves round the base through 180° ; the object of this movement is to enable the observer to measure diagonally placed segments of halos. The box also encloses a 4-volt lamp for the principal light, which is seen through a 7-millimetre aperture (PL); this has been found a convenient diameter for the easy observation of halos.

To the left-hand bar (A) is attached a sliding box carrier (C), easily movable by the hand. Enclosed in this box is another 4-volt lamp, the light from which is trapped by a tapered glass rod (G), which is serrated, flattened, and bevelled to give the effect of a luminous grid, from which no halos are given off. This rod extends over the width of the bar. The observer slides this up or down until it corresponds with the circle of colour which it is desired to measure; since it gives off no halos, and is quite distinct in the dark, it is very easy for the patient to say exactly when the right position is reached.

The right-hand bar (AA) is engraved with an inch scale in numerals, giving the radius of any circle represented by a coloured ring. Knowing the distance (d) of the eye from the source of light, and the radius (r) of the halo circle as measured by the instrument, the angle (a) subtended by this radius with the eye can be at once calculated from the relationship $\frac{r}{d} = \tan a$. On doubling the

result so obtained we have the angular measurement of the diameter of the halo. In order to save calculation this has been reckoned out for measurements taken at 100 inches, and shown alongside of the wide scale in Roman figures; no mathematical mental process is necessary so long as this instrument is used at 100 inches. Three spring indicators

(M), coloured red, green, and blue respectively, are attached in order to register the position of the corresponding halos in the dark.

The distance of the patient from the instrument (100 inches) is controlled by a length of cord, which is wound on an enclosed drum fitted to the base box (DC); the cord can be very quickly rewound when done with.

All electrical contacts are arranged without wire or flex. The lamps are standard size. Spare lamps and trap rods are provided in the base box. All parts fitted are easily accessible.

A plug intake for current is fitted for use with a 4-volt accumulator or a dry battery, or through a resistance from the main supply.

An alternative pattern with a dry battery fitted in the base box can also be supplied if desired.

I have had this instrument at work in my consulting room for several months and have found it quite satisfactory; it has furnished valuable clinical indications.

THE MECHANICS OF THE ANTERIOR ABDOMINAL WALL.

BY

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THE aponeuroses of the lateral muscles of the abdominal wall constitute an element mechanically of great importance in the structure of the anterior wall of the abdomen. The union and the interlacing of the fibres of these aponeuroses are well known, but I have observed a mechanical feature which has not been described and one which is of considerable interest and possibly of practical importance.

The feature, briefly, is this, that the interlacement of the aponeuroses produces a fibrous membrane which is elastic