is a bladder fistula, a complication which has been recorded in quite a number of cases. If the affected coil of colon is lifted out of the pelvis and wrapped in omentum a perforation of the bladder will not occur should an abscess form at a later period. Chronic diverticulitis without complication is not, then, a surgical disease, but if operated on for any reason the bowel should be isolated by omental wrapping and fixed in the left iliac fossa.

III. The accident of *acute perforation* is not likely to be diagnosed precisely before operation. It should be looked upon as a cause of acute peritonitis of not infrequent occurrence; one of the conditions to be borne in mind when the abdomen is opened on account of acute peritonitis of uncertain origin. It is treated on the ordinary surgical lines: the perforated diverticulum is excised and the bowel wall invaginated, drainage being provided as may be necessary. The infection is likely to be of a severe type.

IV. In *subacute and chronic perforation* it is best to wait until the abscess is well defined, and, in the second place, to confine surgical treatment strictly to the evacuation of the abscess and the drainage of its site. I am unable to offer any information regarding the prognosis of recurrence of abscess after simple drainage, a question which would be worth while following up. The danger of serious damage to the bowel wall if anything more is done than evacuation of the abscess has already been mentioned. There is not, in fact, any need to search for a sloughed or perforated diverticulum in order to obtain healing.

V. *Stenosis*, when it is certainly known to be secondary to diverticulitis, will require separate discussion in each individual case. There is no such clear indication for operation as in cancer, where it is known with certainty that the stenosis will be progressive. The study of a large group of cases of chronic diverticulitis followed over several years would be of much value. In what proportion of such cases does stenosis supervene? In what proportion of cases of stenosis does acute intestinal obstruction occur?

Mr. Lockhart-Mummery writes as follows:

"Early recognition of the disease is of the utmost importance, but if symptoms of chronic obstruction associated with the formation of a tumour and chronic sepsis are already present, I believe that immediate surgical interference is indicated and that palliative measures at this stage will more than probably result in a disaster from which it will be difficult, if not impossible, for the surgeon to extricate the patient. As in so many other diseases, one sees that the bad results following operation are almost invariably in those cases which have been submitted to operation at a too advanced stage."

The first question to answer in any given case is, Is operation required? If the patient is suffering, in spite of treatment, from recurring attacks of subacute obstruction with griping pain, distension, and constipation, then operation is undoubtedly required.

What operation is to be done? If the disease is so situated and so localized that resection is easy, then this is the operation to choose. But it may be ruled out by two different conditions: first, the disease may be situated so far along the pelvic colon that anastomosis is impossible; and secondly, the extent of bowel involved may be so great that reunion is difficult. It is all the more unjustifiable to submit the patient to an extensive operation involving risks, in that in colostomy we have not a mere *pis aller*, as in cancer, but a remedy for the disease offering at any rate a fair prospect of cure. It proved curative of the stenosis in one of my patients. In stenosis of the pelvic colon when resection is impossible colostomy in the transverse colon seems the proper thing to do. Unfortunately a short-circuit operation will rarely be feasible in view of the usual site of the disease, but will be preferred to colostomy under favourable conditions as in case No. 4 of this group.

In three cases in this group, one of which was treated by resection, one by colostomy, and the third by diversion, the necessity for operation was clear. The fourth is a borderline case in which the question of the necessity for operation is one for debate: a male, aged 61, not a good surgical risk, operated on two years ago on suspicion of growth, with symptoms of constipation and recurring griping pain with distension. The sequel is interesting as showing that the stenosis is not necessarily progressive. To-day, although nothing was done, his attacks are of less

severity, and recent radiological examination shows the stenosis definitely less marked than it was two years ago. The diverticulitis and constriction involve the distal part of the pelvic colon, but he has diverticula in the whole of the sigmoid loop and in the lower part of the descending colon; colostomy here would be the operation necessary, but as his symptoms at present show no tendency to increase in severity I advised against any surgical treatment.

At the beginning of this paper I gave the observations supplied to me by Mr. Marxer on the localization of diverticulosis on the one hand and of diverticulitis on the other; the bearing of these on the treatment by resection may now be discussed. Is resection generally applicable to cases of chronic diverticulitis without complication?

For two reasons it appears necessary to answer this question in the negative. In the first place it is reported by physicians that the patient can usually be kept in satisfactory health by diet and paraffin. In the second place, the site of the actual disease is often unfavourable for resection and the extent of the bowel involved would necessitate a very extensive colectomy in the great majority of cases. If it is true that the average patient with uncomplicated chronic diverticulitis can be kept in fair health by medical measures, a major operation which is not without its risks does not seem justifiable.

Is resection an operation to be generally adopted for cases of chronic diverticulitis with stenosis? Probably it will be employed more and more frequently in these cases; but it will always, except in a very few cases, be an extensive resection. Resection must go wide not only of the area of diverticulitis, but of any associated diverticulosis. A portion of bowel has to be chosen for anastomosis which is free of developed diverticula; this must be confirmed radiologically, as the presence of diverticula is liable to be overlooked in the course of a laparotomy in a fat-laden bowel. Mr. Marxer, in his letter, refers to one such case in which an anastomosis was made in bowel in which diverticula were present, necessitating a further excision after four years of suffering. Before the indication for resection can be settled the value of colostomy in these cases of stenosis will have to be estimated. It may be that if the bowel is kept empty by colostomy the inflammatory condition will subside and the stenosis resolve. In cases of stenosis obviously unfavourable for resection it is the method to be recommended with a fair prospect of its proving curative.

Observations

ON

ULTRA-VIOLET RAY THERAPY.*

BY

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In this lecture I shall doubtless be expected to give a list of diseases which can be relieved or cured by ultra-violet rays, and to say how the treatment should be administered. This I shall do, but before I proceed to this part of my lecture I must give an introductory account of the rays and their action on the body. This is necessary, because the subject of ultra-violet ray therapy is far from being standardized, and although I can give some help in the selection of diseases for treatment, and some advice in regard to methods of administration, the general practitioner will frequently be confronted by cases in which he will have to use his own judgement in the treatment of patients. For the benefit of those who desire to practise ultra-violet ray therapy as a "side-line" in their general work I shall lay emphasis on methods and apparatus suitable for this purpose.

The first fact to recall is that ultra-violet rays are not all of the same kind. They differ in their wave-length, and they do not all possess the same biological chemical or physical properties. Those with the shortest wave-

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length I shall designate by the number 20, and those with the longest wave-length by 39.† There are rays of every wave-length between 20 and 39. Rays with wave-length shorter than 20 do not concern us, because they do not reach the body. Those with wave-length of 40 are the *visible violet light rays*. The *visible red light rays* have a wave-length of 79. Rays with wave-length of 80 and over are the *radiant heat waves*, sometimes called the *infra-red rays*. I mention these facts because the ultra-violet lamps also emit these other rays as well as the ultra-violet, and the former possess therapeutic properties too. So when the practitioner exposes his patients to the ultra-violet lamp he administers phototherapy and thermotherapy as well as ultra-violet therapy. This is especially the case when certain types of lamp are used.

When these different rays fall upon the body they penetrate for certain distances, and then they are absorbed. Rays possess energy, and this energy is not lost when the rays are stopped. Either heat is produced or chemical changes occur, depending on the wave-length of the rays and the kind of tissue in which the rays are absorbed. The tissues react to these thermal and chemical changes, and various biological effects ensue. These effects, whether physiological, pathological, or therapeutic, are the outcome of the thermal or chemical changes caused by the rays.

Before we study these effects I must say a few words on the distance to which the different rays penetrate before they are stopped. This is important, because various kinds of tissue lie in the path of the rays, and the distance reached by the latter is dependent on the nature of the tissue as well as on the wave-length of the rays. Ultra-violet rays with wave-length from 20 to 24 are stopped in the stratum corneum of the epidermis. Those with wave-length from 25 to 33 pass through this layer, but are stopped in the stratum mucosum of the epidermis—that is, in the living epidermal cells. Those with wave-length from 34 to 39 pass through the entire epidermis, but are stopped by the blood in the subepidermal capillaries. Rays with wave-length of 40 (these are the visible violet light rays) probably do not penetrate further than the longest ultra-violet rays. On the other hand, the visible red rays (wave-length 79) have a much greater penetrating power; some of them reach the superficial strata of the muscles under the deep fascia before they are stopped. The visible green and yellow rays have an intermediate penetrating power. The invisible heat rays have a feeble penetrating power. It is doubtful whether those with the shortest wave-length (80) penetrate much deeper than the subepidermal capillaries, while those with longer wave-length do not penetrate as far.

We may now study the action of the various rays on the tissues which absorb them. As I have already said, the rays expend their energy in the production of thermal or chemical changes; their action ends there. The infra-red rays heat the tissues that absorb them. Since their penetrating power is very slight the distribution of the heat is superficial. The maximum temperature is produced on the surface; below the surface the temperature rapidly drops to normal. The visible light rays also expend their energy in the production of heat. By reason of the greater penetrating power of most of these rays they can heat to a greater depth than the infra-red rays. By means of the visible red rays it is possible to elevate the temperature of the superficial layers of muscle under the deep fascia. The ultra-violet rays with the longest wave-lengths (34 to 39) expend their energy in heating the blood in the subepidermal capillaries. They have no action, so far as is known, on the epidermis. These are the so-called "long" ultra-violet rays.

The rays which pass through the stratum corneum but are stopped by the cells of the stratum mucosum (25 to 33) produce chemical changes in these cells. These changes are of a destructive nature, and they kill the cells if the rays are sufficiently intense or applied for a sufficiently long time. The dead cells are cast off by the process of desquamation. The separation of the remains of dead

† These numbers, when multiplied by ten, give the actual wave-length in millionths of a millimetre; when multiplied by one hundred they give the wave-lengths in what are known as Angström units. The shorter figures are less confusing for lecture purposes. The expressions "short," "medium," and "long," when applied to the rays, refer to their wave-length.

cells is, of course, a natural process, but in physiological states the cells that are cast off have died of old age. The artificial destruction of epidermal cells by ultra-violet rays is followed by certain biological effects. They will be described presently. These rays are sometimes called the "medium length" rays. The rays with wave-length from 20 to 24 (the "short" rays) do not pass beyond the horny layer of the epidermis. Since this layer is composed of dead tissue the rays cannot produce any biological effect in it. If they fell on living tissue they would destroy it, but only to a very slight depth, because their penetrating power is so little. These very short rays can also kill bacteria; but to kill them they must reach the bacteria and not be stopped by overlying tissue. Unfortunately the rays which are most powerfully bactericidal (23 to 24) have a very feeble penetrating power. As the wave-length gets longer the germ-destroying power falls rapidly. Consequently we cannot expect ultra-violet rays to destroy bacteria (that is, by direct action) if they lie more than the very slightest depth below the surface.

There is another important chemical change which the rays bring about. This is what is known as the "activation of cholesterol." This substance is present in all growing tissues, and it plays an important part in metabolism. It cannot perform its function unless it is rendered active. Ultra-violet rays possess this activating power. In this way the curative action of the rays in rickets is explained.

Let us now consider the biological effects which follow the physical and chemical changes brought about by the different rays. The invisible heat rays and the visible light rays are thermogenetic. Consequently the biological effects of these rays are those of heat. The effects of heat are far-reaching, but the time at my disposal does not allow me to go into the matter. I might mention, however, that heat increases the action of those ultra-violet rays which bring about chemical effects.

It is believed that the ultra-violet rays with the longest wave-lengths (34 to 39) have no chemical action on the tissues. It is probable that they are thermogenetic. Their biological effects are therefore those of heat. The chemical changes induced in the living epidermal cells by the rays of shorter wave-length are not immediately followed by any visible effect; but after an interval of two to ten hours there develops an erythema. It lasts from a few hours to a few days, according to the length of exposure and the intensity of the rays. It then fades away. Desquamation begins after four or five days. The degree of erythema and the amount of the desquamation also depend on the length of exposure and the intensity of the rays—that is, on the dosage. With small doses the erythema is slight and the desquamation is indiscernible. With less small dosage the erythema is more evident and the desquamation is apparent. With heavy dosage the erythema is intense and blisters may form. After a few exposures sufficient to procure a fair degree of erythema there develops in many subjects a pigmentation of the skin. This is due to the formation of a substance known as "melanin" in the basal cells of the epidermis. The most potent erythema-producing rays are those with wave-lengths from 29 to 30. The pigment-producing rays are those with wave-lengths from 29 to 33. Rays with wave-length a little shorter than 29 can produce marked erythema without pigmentation.

Accompanying or following these changes in the skin are others in other parts of the body, but the mechanism of their production is not known. We may attribute them to the absorption of substances formed by the action of the rays on the epidermal cells. One of these substances is activated cholesterol. Some of these changes are known. One of these is an increase of the calcium and phosphorus content of the blood; more are absorbed from the alimentary canal. The calcium content of the blood cannot be increased by taking calcium compounds by the mouth. Hence this method of administration is of little value unless the skin is irradiated by ultra-violet light. The red blood corpuscles and haemoglobin are increased by a course of exposure of the skin to the rays.

Another very important change is an increased power of the irradiated body to combat chronic infection. Eidenow

has shown that the bactericidal power of the blood of animals is increased by irradiating the skin. In man, however, the bactericidal power of the blood is usually high, but it is possible that the gain in power to deal with infection may be due to the absorption of proteins which may be formed by the destruction of the protoplasm of the epidermal cells, the action perhaps being akin to that of protein shock.

The ultra-violet rays, or the products of their action on the epidermal cells, stimulate the nerve endings. In this way the organs of the body and their blood supply may be influenced by reflex action. The dilatation of the sub-epithelial blood vessels is an axon reflex (Dixon). It is likely that there are other forms of reflex action. The internal secretion of the ductless glands may be influenced. The nature of the influence—whether stimulation or depression—and the wave-lengths which are most potent for the production of different effects are at present unknown, and need investigation by the experimental physiologist.

Our knowledge of the physiological properties of ultra-violet rays is insufficient to enable us to foretell with accuracy all the diseases which can be successfully treated. Most of what we know regarding the therapeutic properties of these rays has been learnt by clinical experience. The power of the rays to produce erythema renders them useful in the treatment of inflammation of the skin when the state is chronic and the blood supply poor. The *direct* bactericidal power of the rays renders them of some additional use in local infection, although this action is very restricted on account of the slight penetrating power of the germ-killing rays. The production of local erythema is of use in the treatment of referred pain. Relief may be procured by a process of the nature of counter-irritation. The increased power of the body to deal with infection after administration of the rays renders the treatment of value in cases where the resisting power of the body is enfeebled, as in conditions of debility after fevers or local infection. The increased absorption of calcium and phosphorus following general irradiation renders the treatment of value in certain types of bone disease, and, if suppuration is present, there is an additional indication by reason of the enhanced power of the body to combat infection.

Thus it is mainly by *indirect* action that the ultra-violet rays bring about therapeutic action. Obviously it must be by indirect action when the disease is deeply situated and beyond the range of penetration of the rays. But even when the irradiated skin is the seat of disease it is almost always by indirect action that therapeutic results are obtained. These results can be obtained by exposing the skin of other parts of the body and leaving out the affected part. It is only in a very few diseases that local treatment of the affected part gives some benefit, and even in these the treatment of other areas of the skin—that is, *general* treatment—is of more value than the local.

Apart from their power to activate cholesterol and increase the absorption of calcium and phosphorus, and perhaps their power to increase the resistance to infection, none of the known therapeutic properties of ultra-violet rays are peculiar to them and not possessed by some other agents. Many of the maladies for which the rays are recommended by various workers can be treated just as well, or better, by other physical or electrical or thermal agents. I say this with no intention of disparaging ultra-violet ray therapy. Indeed, this form of treatment is capable of yielding results such as a feeling of well-being, increased mental vigour, heightened resistance to infection, and other good effects in which the *modus operandi* of the rays is difficult to ascertain. Even for the production of results which can be obtained by other methods the rays are convenient and frequently efficient. But if we treat by ultra-violet rays all the cases that do not respond to drugs or expectant treatment we shall not obtain a good balance sheet of success and failure.

With regard to apparatus, there is no lamp which emits heat, light, and ultra-violet rays of every wave-length. Different lamps give different selections of all three. So far no essential difference has been established between the results obtained by the use of one type of lamp

as compared with another. The plain carbon arc lamp emits much heat and light, but the proportion of ultra-violet rays is small. Consequently the exposure of the patient is lengthy. By coring the carbon with certain metal salts the exposure can be reduced, but white fumes are given off, and these make the air cloudy and the objects in the room are gradually covered with a thin film of white powder. Lamps with tungsten electrodes are open to the same objection; their output is poor in heat rays but rich in ultra-violet rays. The lamp which I recommend is the mercury vapour lamp. Its output is rich in ultra-violet rays but poor in heat rays. It gives off no fumes. It is a clean, cold lamp. It works automatically, needing very little attention. Patients feel no warmth when under it, and they may complain of chilliness during treatment, especially in the winter months, unless the room is adequately warmed. A lamp of full size should be chosen. Small lamps are not of much use. Treatment of relatively small areas of the skin can be given by their means, but too much time is occupied when general treatment is required. For local treatment of less accessible regions such as the nose, throat, etc., a special lamp, the water-cooled mercury vapour lamp, and quartz rod applicators, are used. It is also necessary when long exposures are to be given to cutaneous lesions and exsanguination of the skin is required. This type of lamp will only be needed by those who practise ultra-violet ray therapy as specialists.

I shall now describe what I think is the simplest and one of the most effective ways of administering ultra-violet ray treatment to the patient. It must first of all be realized that *general treatment*—that is, the exposure of the entire skin or large areas of it—is necessary in almost all the diseases which can be benefited by the rays. General treatment is required if the disease is general, even if its manifestations are local. It is necessary even if the disease is local. Only in a very few local diseases is local treatment advisable.

The patient, divested of clothing, except the genitalia, should lie horizontally on a couch on his back, his eyes protected by goggles. The lamp should hang three feet above the middle of the body, but a little to one side, so that if the lamp should break the hot mercury will not fall on the skin. At his first visit give a two minutes' exposure to the anterior surface. Then turn him on his back and give the same length of treatment at the same distance. Repeat the treatment every other day, increasing the exposure by half a minute at each successive visit until he receives ten minutes to the front and ten minutes to the back. This will complete a course of treatment. This method will, in the great majority of patients, cause little or no erythema, scarcely any desquamation, and no pigmentation. If erythema is caused it is faint and transient, lasting for a few hours only, and disappearing before the next treatment. Should it be noticed when the patient comes for his next treatment, he should receive no further application until it has disappeared; his next dose should be no larger than the preceding one. Should it be found necessary to give a longer course, time can be saved by bringing the lamp nearer the patient—say two feet. If this is done the exposure should last, not ten, but five minutes.

Children should receive an exposure of one minute at their first visit, and it should be increased by half a minute at each successive visit. In the case of infants the initial exposure should be half a minute and subsequent exposures should be increased at the rate of a quarter of a minute for each successive treatment. These figures are only intended to provide a rough guide. If, on any occasion, the patient interrupts his course, the practitioner, when resuming the application, must take note of the length of the intermission and reduce the length of the next exposure in accordance. If the interval has been as long as two weeks or more he should resume with the initial dose.

Local treatment can be practised to a limited extent with the mercury vapour lamp. The action of the rays can be restricted to the affected area of skin by shielding the skin in the vicinity by black paper. When giving local treatment it is usually necessary to increase the dosage so as to procure evident erythema. The skins of different

patients vary greatly in their sensitivity to the rays, and the dose which would cause slight erythema in one might procure intense redness and subsequent blistering in another. The best way to avoid this is to make a series of test exposures on small areas of skin. Four small windows, each being one inch square, should be cut fairly close together in a sheet of black paper. The paper should then be wrapped around the forearm and the four areas of uncovered skin exposed to the rays, the lamp being at a distance of two feet. These areas should receive one, two, three, and four minutes' exposure respectively. The same hour next day the areas should be examined. The length of exposure to the area in which there is distinct redness should be the length of treatment to the affected region.

The diseases which may be treated by ultra-violet rays I shall classify in three groups. The first includes those in which the treatment will always effect a cure. The second contains those in which the treatment will generally effect a cure, either alone, or in conjunction with other forms of treatment. The third includes a large number of diseases or cases, mostly common and obstinate, for which the treatment is now being tried. In these diseases the insufficiency of experience renders it difficult to say whether the rays are of real use. To these groups I shall add a fourth, which will include those in which the treatment is likely to produce harmful results.

Group 1.—The disease which must be given pride of place in ultra-violet ray therapy is rickets. For this the treatment may justly be regarded as a specific. I do not know any other disease for which it is a specific, although tetany and laryngismus stridulus—when occurring in rickety children—are said to respond equally well.

Group 2.—In this group I would place first the cases of infants who are unable to assimilate their food, and who consequently waste. If no organic disease is present the major number begin to thrive and put on weight. The treatment must be applied very cautiously and minute doses given. Children who have been the subjects of the fevers which commonly occur during their early years, but are left in a weak debilitated state, respond well to the treatment. Their health improves and they gain in weight. Nasal and bronchial catarrh lessens or disappears, and aural discharge loses its offensive character and may disappear. If the last-mentioned trouble is present, that most valuable form of treatment, zinc ionization, must not be forgotten. Adults who are left in a debilitated state after influenza or similar types of fever improve greatly after ultra-violet irradiation. In surgical tuberculosis the rays can play a valuable part in bringing the disease to an end; but additional treatment is generally required, such as surgery, application of splints, etc.; and residence at the sea or in the country are necessary for most cases. For this reason the treatment of surgical tuberculosis by ultra-violet rays in large towns is frequently unsuccessful. In dermatology the disease which is most often treated by the rays is lupus vulgaris. General treatment is more effective than local, though they can be combined with advantage. Local treatment requires the water-cooled lamp. The electro-thermic methods are very useful in local treatment, but general treatment should not be omitted. Other infective diseases of the skin, such as impetigo contagiosa and acne vulgaris, respond well. Patients who are liable to boils and carbuncles may be treated by the rays with advantage. Their low resistance to infection by staphylococci can thereby be increased. In seborrhoea I have had some good results in obstinate cases. In true eczema success is not often obtained. The so-called "weeping eczema" (which is really seborrhoea) improves under the treatment, and the "trade eczemas" (which are really forms of dermatitis caused by chemical irritants) can be cured if the causes are removed. Non-specific indolent ulcers should receive a trial of the treatment, both local and general, and success will often be obtained. Erythema pernio is said always to respond to the rays, but I prefer diathermy. In true psoriasis I have had no success with ultra-violet rays. Some cases of pruritus ani and vulvae can be freed from the itching. These cases require local treatment, and when it is given every particle of mucus and exudation and previously applied unguents must be removed. Some

writers have described good results in the treatment of erysipelas by the rays. I have had no personal experience. In alopecia areata the hair grows again after a course of local treatment by the rays. A long course may be required.

Group 3.—This includes a large number of chronic maladies and obstinate cases which resist drug treatment. The "rheumatic material," such as chronic fibrositis and arthritis, with which the various departments of physiotherapy are so plentifully supplied, has been treated by the rays, but I have had infinitely better results—at any rate in women—by pelvic diathermy. Treatment of chronic fibrositis and arthritis by the rays will generally be followed by disappointment. The ultra-violet rays have been tried in infection of the uterus and its adnexa and the pelvic supporting tissues, erosion, and some forms of dysmenorrhoea, but here again pelvic diathermy gives far better results. In obstinate cases of sciatica and brachial neuritis I have had little success with the rays after other forms of physiotherapy had failed, although it is possible that the cases which had been cured by the latter would have responded to the rays. Hyperpiesis, chronic bronchitis, bronchial asthma, hay fever, Raynaud's disease, acrocyanosis, and other diseases are being treated by ultra-violet rays, and success has been claimed by different writers, but sufficient experience has not been gained to enable a definite statement to be made regarding the therapeutic value of the rays in these diseases.

Group 4.—This includes the diseases and patients for which the rays should be administered with extra caution or not at all. Patients with general pyrexia should not receive ultra-violet ray treatment. In acute local infection the rays should not be applied locally, nor should general treatment be given if the body temperature is raised. If pus is present the treatment should not be given until it has been evacuated. If it is suspected, the treatment should be postponed. In pulmonary tuberculosis the treatment should not be given, except by an expert; quiescent phthisis has been rendered active. It is inadvisable to apply the rays to patients who are suffering from failing hearts or who are the subjects of Bright's disease. It is generally inadvisable to give the treatment to very old people. During menstruation ultra-violet ray treatment should be omitted.

In concluding a short lecture on a very large subject I would insist on treatment by ultra-violet light being under the direction of medical men. Unqualified people, even if they are trained, can only administer the rays, but the doctor can employ them to treat disease.

CONGENITAL OESOPHAGEAL OBSTRUCTION.

BY

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CONGENITAL malformations of the oesophagus are by no means extremely uncommon, and usually manifest their presence within a few days of birth; almost all prove rapidly fatal. Life may, however, be saved in some of the rarer cases by prompt intervention, and I propose to give details of a case of complete oesophageal obstruction, operation, and recovery, followed by pyloric stenosis, a second operation, and recovery. Before doing so I will outline the development and the congenital malformations of the oesophagus.

DEVELOPMENT.

From the primitive foregut the pharynx, oesophagus, and stomach are developed. In the third week the oesophagus is a mere sphincter, or constriction, between the pharynx and the stomach.¹ When the neck is differentiated during the second month the oesophagus undergoes a rapid elongation; the chief factor in producing this elongation is the development of the lungs and pleural cavities, whereby the stomach is pushed backwards into the body cavity. Up to the third week the trachea and oesophagus form a single structure; the lung-buds have not yet appeared. There is, however, a histological differentiation of the two parts, which will be described later.