of cases for the first twelve or twenty-four hours after operations. It must be most harrowing for children to watch others go through the process of "coming round" from an anaesthetic, and a most undesirable preliminary to a subsequent operation on themselves.

Adolescents and Adults.—No special wards are indicated for these. The girls and boys are in distinct sides of the hospital, so that adults could be accommodated in one end of the ordinary wards.

Paying Patients.—Similarly no wards are indicated. Small bungalows in suitable positions could be provided.

Education.

Regulations as to education in hospital-schools are laid down by the Board of Education. In this plan no design of the schoolrooms is indicated, but positions are suggested. The main school lies to the east of the site and is surrounded by the workshops, residential school quarters, covered playground, reading and play rooms. The main school block would be attended by walkers and chair cases from the central block of the hospital, as well as by the children in the residential school quarters. The schoolrooms in the centre of the south block are so placed that the children confined to bed in this ward can be pushed to school easily, bed and all.

The residential school quarters are for children who, though they no longer require hospital treatment, would get no education if sent home, owing to the relation of the degree of their disability to the distance of the school from their home. Here, again, no internal structure is indicated, but as some of the children in these quarters will probably be convalescent from tuberculous conditions, one or two open-air dormitories might well be provided. No cubicles or dormitories should be on the north side. The size of this particular building should not be regarded as a reliable guide as to the residential school needs of an area requiring a hospital of 200 beds. A group of small cottages would be an alternative method of housing the older children. The children in hospital and in residential school need reading rooms, play rooms, covered and open playgrounds.

The Workshops should supply training in various handicrafts. Besides those of general application, such as carpentry, cobbling, leather and basket work, in each district the local trades should be specially considered.

Splint Shop.—It is an immense gain to an orthopaedic hospital that all the splints and appliances needed in the hospital should be prepared in its own workshops. The instrument makers can then work in constant touch with the orthopaedic surgeon, and so carry out his ideas exactly. Further, in urgent cases special splints can be made immediately.

It is recommended that part of the workshops should be of the open-sided hut type, and that all should be specially well ventilated, for they will be used in the training of children in the hospital and residential school. It will sometimes be possible to give permanent work as instrument makers or instructors to children who have passed through the residential school and shown special aptitude.

Maintenance.

Complete fulfilment of the conditions laid down by the Ministry of Health and the Board of Education, which include arrangements for dental and refractive work, is necessary so that the "approval" of these departments may be obtained for work under (a) the Maternity and Child Welfare Act, (b) the Education Act (1918), and (c) the tuberculosis clauses of the Insurance Act.

Great benefits will be derived from close association with the medical officers of health and tuberculosis officers of the group of local authorities served by each hospital-school.

Definite working arrangements should be made with the local authorities by which the costs of maintenance, worked out to an average for each child and approved by the Board of Education, are paid on a capitation basis by the local authority concerned in accordance with the Acts mentioned above.

Expenditure.

The following is an analysis of the weekly expenditure per child at Baschurch for the quarter ending December 31st, 1919:

	£	s.	d.
Food	...	0	19 1
Drugs and chemicals	...	0	1 9
Instruments and appliances	...	...	...
X-ray apparatus	...	0	4 4
Boots and leather	...	...	...
Salaries	...	0	11 2
Repairs and renewals	...	...	...
Buildings and machinery	...	0	5 0
Hardware and crockery	...	...	...
Furniture and bedding	...	...	...
Oil and fuel	...	0	2 1½
Laundry	...	0	1 0
Printing	...	...	...
Stationery	...	...	...
Postage, telegrams	...	...	...
Rent, rates	...	0	2 10
Carriage	...	...	...
Railway fares	...	...	...
Miscellaneous	...	...	...
Total	...	2	7 3½

The total weekly cost is seen to be greater than the estimate of £2 given in the paper published in October. This is due to the rise of prices, which unfortunately has not yet stopped.

Beyond all these material advantages, there is needed in the staff enthusiasm for the work, orthopaedic experience, with a balanced judgement of the values of various methods of treatment, the highest degree of skill, and well arranged clinical team work. Further, the efficacy and permanence of the work of such a hospital depends on early recognition and treatment and on thorough after-care. The use of all the health services of the district, official and voluntary, especially the work for infant and child welfare, should lead to the early discovery of crippling conditions, and avail to bring them into touch with orthopaedic treatment without delay. Similarly, each patient on discharge from hospital should be attached to one or other of the orthopaedic clinics scattered through the district. Careful after-treatment and supervision will then make for the attainment of the best result possible for every child.

THE X-RAY TREATMENT OF ACNE VULGARIS.

BY

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INTRODUCTORY.

IN spite of the general advance in dermato-therapy during the last decade, it is discouraging that few of the commoner skin diseases can be permanently cured. It is now established that acne vulgaris—perhaps the most widespread minor skin ailment in this country—no matter how extensive, or in what stage it presents itself, can be permanently cured by judicious x-ray treatment. I am well aware that, in making this statement, I lay myself open to the retort that radiotherapy for so trivial a complaint is a dangerous and quite unjustifiable remedy. The comedo and pustular stages of the condition are, however, very objectionable, and women especially cannot afford to regard the prospect of permanent disfigurement by pitted or keloidal scars with equanimity. It is surprising to find that most of the larger textbooks incline to the opinion that x-ray treatment should be reserved for the most intractable cases. In these, however, irremediable cicatrization will already have occurred, and the final appearance when cure has been brought about may resemble the after-effects of small-pox or lupus. It would seem to be an axiom of therapeutics that nearly all its most effective weapons are dangerous in unskilled or injudicious hands; but no reasonable member of the profession would therefore limit the administration of salvarsan in syphilis, of emetine in dysentery, or of chloroform in the major operations of surgery. To relegate an invaluable and approved remedy to the position of a last resource because there have been disasters among the earlier cases, is to assume an attitude for which there is now no justification, and which it is the main purpose of this article to repudiate.

Pathology.

Acne vulgaris is mainly attributable to the activities of a particular microbacillus first grown by Sabouraud. Every comedo contains it in more or less pure culture, as can be proved histologically by suitable staining reagents. The acne pustule is the result of contamination of the

comedo with various other organisms, among which the staphylococcus predominates. The deep-lying acne nodules also contain the acne bacillus, but in reduced numbers; and cultivations from these, as from many other types of very chronic abscesses, are not infrequently sterile.

The acne bacillus flourishes only in the presence of sebum, and is found more or less profusely wherever sebaceous glands are situated. As it can be recovered from the normal gland, it follows that it is not necessarily pathogenic, a circumstance of which there are other instances—for example, (1) *B. coli* in the large intestine is physiological, but in an appendix abscess it is pathological; (2) Vincent's spirillum is a normal parasite in the saliva, but a dangerous factor in certain types of buccal and pharyngeal ulceration; and so with the pneumococcus, *Streptococcus faecalis*, and *Staphylococcus albus*, all facultative pathogenic organisms.

The sebaceous glands share the increased activity of all glandular structures at puberty; and it is, perhaps, to their superficial position and liability to fortuitous secondary infection that the appearance of acne at this time of life may be due. The comedo is nothing but a sebaceous gland the duct of which is choked with inspissated sebum, cellular detritus from the corneous layer, and colonies of the acne bacillus.

We are still unable to explain why this "inspissation" should occur; but, as with other secreting organs of the human body—as, for example, the appendix, gall bladder, and kidney—once it has taken place, secondary infection is only a matter of time and opportunity. Streptococci, staphylococci, the bottle bacillus, and various yeasts are frequent contaminations; and the symbiosis thus established appears to increase the proliferative and irritant characters of each. Whilst infected and blocked glands become pustules or spread deeply into the cutis and become nodular abscesses, those in the immediate neighbourhood react to the irritation by an increased output of sebum, which in its turn favours extension of the condition by the rich pabulum it provides for new generations of the causative organisms. We are thus confronted with a very simple example of a vicious circle.

The morbid histology, so far as it concerns our thesis, may be considered under three headings: (1) Involution of the comedo to a condition of normal sebaceous activity; (2) secondary infection and acute suppuration, with destruction of the sebaceous gland, and eventual scarring or pitting; (3) chronic suppuration which may result in the production of (a) deep nodular abscess formation, or (b) cicatrization, or hypertrophic and true keloidal tissue.

The structure of a comedo has already been alluded to. In addition to inspissation of sebum and cell detritus in the duct, there is usually a small round-celled infiltration about the duct and neck of the affected gland. This infiltration is excessive in the second stage, that of acute suppuration; being usually extraglandular, it explains why it is that such an abscess is difficult to express, an easy procedure in the case of a comedo. It is with the results of the third stage, the chronic suppurative condition, that our discussion is mainly concerned.

Histological sections reveal the well known cells common to all the granulomata—for example, chronic sepsis, tubercle, syphilis, etc. Fibroblasts, mast cells, giant connective tissue cells, leucocytes of various kinds, and strands of fibrous tissue are present in all such sections in varying degree—the fibrous element predominating in direct proportion to the chronicity of the lesion. The periglandular fibrosis is often exceedingly dense, a fact which may have some bearing on the frequent failure of vaccines and topical application to reach the micro-organisms in the ducts, where they lie secure, and in a state of latent or potential virulence, which only needs such factors as constipation, dyspepsia, menstruation, or the abuse of alcohol or tobacco, to call them into activity.

Treatment by X Rays.

If the preceding pathological sketch is correct in essentials, the causes of failure to cure by internal and external medication or by vaccines become apparent, and can be ascribed in the main to the presence of young connective tissue cells and their fibrous derivatives, which bar the access of all remedial agents to the seat of the disease. The action of x rays is selective on fibroblasts and on any unorganized and rapidly proliferating

cellular structure. It is this selective affinity which is responsible for the favourable destructive effects on certain types of cancer, more especially in sarcoma, which is a connective tissue cell derivative.

Its relatively superficial position in the epidermal or subepidermal plane renders the acne lesion peculiarly accessible to the penetration and direct action of x rays. But the rays possess a still more valuable characteristic: they are inhibitory to the physiological action of the secreting cells of sebaceous glands—as well as sweat glands, thyroid and ovarian glands, etc. If, therefore, the fibrous capsule of the infected comedo is "dissolved," and at the same time the secretory activity of the gland itself diminished or altogether inhibited, two favourable conditions for the growth of the acne bacillus will have been removed and the vicious circle broken. Whether the explanation offered is correct or faulty is of academic importance only. The incontrovertible fact is that x rays will cause involution both of the comedo and the deep nodular abscess, and reduce to a minimum the still greater disfigurement already caused by hypertrophic scars and keloidal tissue.

Dose of X Rays.

The dosage of x rays required to effect a cure in any particular case depends in the first place on the stage of the infection. For the sake of convenience, and in conformity with the pathological data, three such stages can be clearly distinguished: (1) Comedo formation; (2) comedo and pustulation; (3) nodulation, or deep infection, with concomitant fibrotic or keloidal changes.

In stage (1) local applications of sulphur, resorcin, mercury, or salicylic acid, are almost invariably prescribed either in a lotion or in an ointment. Soft soap is frequently incorporated in the ointment base, or directed to be used antecedently in the form of a shampoo with hot water. Stock or autogenous acne and staphylococcic vaccines are administered periodically; and the results, as long as treatment is continued, are satisfactory, the comedones disappear, and the case is apparently cured. It must be admitted that in the great majority of cases, and in spite of the most punctilious attention to detail on the part of the patient, relapse is exceedingly common. I am of opinion that in some cases treated by this method the energetic friction and application of local remedies has actually favoured secondary infection with staphylococci and the development of pustules. Be that as it may, it will be generally conceded that the process is tedious and causes considerable discomfort to sensitive skins. The x -ray treatment of the comedo stage is entirely free from both these objections.

Method.

In stage (1), in which only mild surface action of x rays is required, a filter is not used. A tube of medium hardness, working at a spark gap of between four and five inches, is the best for the purpose. A visible erythema—the so-called "reaction"—should not be aimed at; nor is it necessary to produce subjective sensations of itching or heat. The dose must be controlled in every case by the change of colour of a reliable make of the Sabouraud-Noirée pastille, which should be accurately placed at a point exactly equal to half the distance between the anticathode of the tube and the surface irradiated. It is also of the utmost importance that the trajectory of the rays should make a right angle with the plane on which they fall. As the areas usually affected by acne (except in the case of the back and chest) are relatively curved, and not plane surfaces, this direction can only be approximately followed in most cases. The summit of the curve will obviously be the nearest point to the anticathode; and it follows that the measurement of the distance from the anticathode, which should not be less than 6 in., must be made from the centre of this area. For a case of uncomplicated comedo formation a dose approximating to four-fifths of the full epilation dose (or B tint) is generally sufficient to effect a marked improvement. The administration is usually given in two sessions, with an interval of five days between them. In some cases the activity of the sebaceous glands is not effectively damped down by four-fifths of the pastille, and another two-fifths* or

* I use a recent modification of Corbet's radiotintometer (made by the Cox-Cavendish Electrical Company) for accurate estimation of slight colour changes.

three-fifths of the full dose may be required. In all cases ten days must be allowed to elapse after the primary four-fifths B dose has been administered. If this precaution is rigorously adhered to there is no risk of overdosage. The appearance of an erythema is the signal for cessation of x -ray application to that particular area; the final effect of the treatment cannot be accurately gauged until all reaction has passed away. A cure can be anticipated in the majority of the cases in which it has occurred; for slight and invisible cutaneous atrophy, in which the sebaceous glands particularly are implicated, will ensue. It is again emphasized that the atrophy of the sebaceous gland is neither physiologically desirable nor a factor in the treatment. Inhibition of an excessive activity is all that is required to cause involution of the comedo. In every case of facial acne treated by x rays the eyebrows, eyelashes, and mucous membranes must be effectively protected by strips of malleable lead foil, which can be fixed *in situ* by rubber strapping.

In stage (2), when pustulation and dermatitis are marked, an effort should first be made to allay them by the application of mild antiseptic and detergent lotions of lead, calamine, or mercury oxycyanide (1 in 4,000). A few days later the areas can be treated by x rays. Two-fifths of the B tint can be given at intervals of ten days, and repeated as found necessary. "Erythema reaction" should be carefully avoided in the pustular stage.

While there are conceivable alternatives to radiotherapy in (1) and (2), the presence of intradermic and subdermic nodules and cold abscesses, periglandular fibrosis, and keloidal tissue (stage 3) is a direct indication for x -ray treatment, for by no other agency can their involution be permanently achieved. The deeper situation of all these lesions calls naturally for the use of harder or more penetrating rays. These can be obtained in two ways: either (a) by the use of a "hard" tube, with a spark-gap working at a distance of 5 to 6 in., or by (b) interposing a screen of sheet aluminium, which cuts out the soft erythema-producing rays altogether. The filter should have a thickness of 0.5 mm., and with this in position a full pastille dose (tint B) may be given at the first session without risk. (The pastille holder must be used on the proximal side of the screen.) Considerable improvement will usually be noticed in ten days or a fortnight, and filtered half-pastille doses may be repeated at this interval until involution is complete. The use of a filter will prevent or delay the development of erythema reaction, and in most cases a satisfactory result will have been obtained before this develops.

Local relapse after efficient treatment by x rays has, in my experience, rarely occurred. A case I treated in 1913 will suffice to illustrate the contention. The patient, an unmarried lady of 26, had suffered from the deep nodular variety with recurrent suppuration and hypertrophic cicatrization for many years in spite of vaccine treatment, local applications, ultra-violet rays, and yearly visits to a sulphur spa. The case was undertaken with considerable trepidation, as at that time my experience was not extensive. During the seven years which have since elapsed there has been no recurrence, nor is there now the slightest suggestion of cutaneous atrophy, although, as a result of treatment, the patient developed temporary erythema at the time.

X-ray Stigmata.

The ill effects produced by overdosage of x rays are well known, and may be either permanent or temporary.

An x -ray burn is a serious disability; it can be caused only by massive or repeated and uncontrolled doses of x rays. In the most intractable cases painful ulcers may develop. More usually there is parchment-like atrophy of the skin, pigmentation, and minute vascular stigmata (telangiectases), with permanent, partial, or total destruction of hair follicles. Such appearances are still occasionally the result of inaccurate dosage in epilation treatment for tinea of the scalp and chronic sycosis barbae, and more excusably after massive doses for lupus vulgaris and epithelioma. Modern refinements, however, have rendered the accident relatively uncommon, even in cases in which massive doses are essential. If the rules insisted on for acne cases are rigorously followed such accidents will not occur in the treatment of this disease. It is therefore with

the results of mild irradiation only that we are concerned. These are temporary, as a rule, and consist, as far as evident at all, of disturbances in the physiological distribution of pigment. As might be expected, blonde individuals are more susceptible in this respect than dark, and these should always be warned in advance of the possibility of the temporary appearance of "freckles" as a result of the x rays. In no case do they result in anything approaching the acne nodule or pustule in degree of disfigurement, and in a few weeks they vanish. The only treatment called for is the occasional application of calamine lotion, which is also useful in cases which develop erythema reaction. Grease in any form is never well tolerated, and ointments should therefore not be prescribed for patients undergoing radiotherapy.

CONCLUSIONS.

1. Acne vulgaris in its early stages can be relieved by vaccines and the application of lotions and ointments containing sulphur, resorcin, or mercury.
2. As far as the author knows, cure can only be attained by the judicious application of x rays.
3. The nodular and keloidal varieties of the disease are not amenable to relief or cure by any other method.
4. Relapse after apparent cure by x rays is rare. Should it arise it can be dealt with by further irradiation.
5. There are no permanent contraindications to the treatment by x rays.
6. Temporary cosmetic stigmata are sometimes met with, especially in blonde subjects; but permanent disfigurement of any kind is the result of faulty technique.

TREATMENT OF SLEEPING SICKNESS BY SALVARSANIZED SERUM.

BY

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THE history of the treatment of sleeping sickness in the past has been one of optimistic hopes resulting in failure, as each new method tried has been found to be nearly the cure, yet to have just fallen short of success. This applies more especially to African patients, for while certain Europeans and Asiatics have been undoubtedly cured of the disease, no such success has followed the treatment of natives. The reason may be that the African native is seldom seen in the very early stages, and being also more susceptible to the poisonous effects of the arsenic preparations used, is unable to stand the large doses employed to kill the trypanosome in the cases of non-natives.

For nearly a year after its introduction atoxyl was hailed as a definite remedy, only to prove not quite successful, while more recently Drs. Rodhain and Broden in the Congo have shown that salvarsan produces great improvement in early cases, although they do not claim it to be a cure, and definitely state that it is of little value if the trypanosome can be found in the cerebro-spinal fluid (Manson).

Quite early in the disease the trypanosome appears to gain an impregnable position in the central nervous system, and when attacked by drugs which drive it from the blood stream, remains undefeated in the spinal cord, in the same way as syphilis, which in the early stages is easily cured, but once it has established itself in the central nervous system complete cure is more problematical.

It would appear therefore that if sleeping sickness is to be cured, except in the earliest stages, the trypanosome must be attacked in the spinal cord, as well as in the blood stream. With this idea I commenced treating cases by intraspinal injections of neo-kharsivan; unfortunately the first case so treated died as a result of the injection.

Case I.—W., a man aged about 40 years, was examined on September 26th, 1918. The glands were small, but typical. Trypanosomes were present in the gland juice. An intravenous injection of 0.6 gram neo-kharsivan was given on September 27th, and on October 1st an intraspinal injection of 0.025 gram neo-kharsivan, after 10 c.cm. of cerebro-spinal fluid had been drawn off. The patient died on the following day.