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# BACTERIOLOGICAL TECHNIQUE.

## NOTES OF A PRACTICAL DEMONSTRATION OF WASSERMANN AND WIDAL TESTS.

(By Rao Bahadur Dr. M. Kesava Pai, M.D. & C.M.)

*The extraction of blood for the Wassermann Test.*

The original method of extraction of blood was by pricking the finger with a flat surgical needle and the "coaxing" of blood "milked" from the puncture into a Wright's capsule. This method having been found to be tedious it was substituted by extraction from a cut with a razor which allowed the blood to flow freely and quickly. The present method which is the best is by extracting the blood from a vein on the dorsum of the hand or at the bend of the elbow into a sterile hypodermic syringe and the expulsion of the blood immediately before clotting into an ordinary sterile glass capsule. About 2 c.c. or $\frac{1}{2}$ drachm of blood is required and can be easily had by the last-mentioned method.

*The Antigen.*

In the original Wassermann's method the antigen was made from the extract of a syphilitic organ, *e.g.*, the liver of a syphilitic fœtus. It was discovered later that the extract of the normal liver, heart, etc., of an animal gave the same reaction as extract of the syphilitic liver, the lipoids extracted from normal organs having the same combining power with the patients' serum as syphilitic extracts. The addition of a small quantity of a

cholesterin gives these lipoids a better combining power with the syphilitic amboceptor of the patients' serum and the latest method of preparation of antigen is by combining a little cholesterin with alcoholic extract of the heart muscle of a bullock or other animal.

*Hæmolytic amboceptor for sheep cells.*

This is obtained by giving a rabbit a series of injections of sheep corpuscles which are obtained by collecting sterile sheep blood in sterile citrated saline and washing this three times with normal saline in a centrifuge.

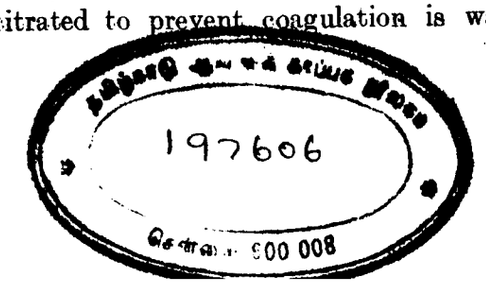
The serum of the blood extracted from the rabbit some days after the last injection contains large quantities of hæmolysin for sheep corpuscles. The production of this hæmolysin in the rabbit is on the same principle as the production of immune bodies for Typhoid, Plague, etc. by injection of the respective vaccines into individuals.

*Complement.*

The complement which is the real substance causing lysis in all hæmolytic and bacteriolytic reactions is present in all normal sera. The serum of the guinea pig obtained from the freshly drawn blood contains a large amount of complement and hence guinea pigs' complement is mostly used in the Wassermann test. The "Pooled" blood of at least 3 guinea pigs, extracted from the heart, is required, as a guinea pig is occasionally found with poor complement and it is therefore not safe to use complement from a single animal. Complement is thermolabile, *i.e.*, destroyed by heating to 55° C. but amboceptor is thermostable, *i.e.*, is not destroyed by heating to 55° C.

*The Wassermann Test.*

*1st Stage :* Sensitisation of sheep corpuscles. Sheep's blood citrated to prevent coagulation is washed three






times with normal saline solution in the centrifuge and then sensitised with a high-litre anti-sheep hæmolytic serum obtained from a rabbit highly immunised against sheep red corpuscles.

*2nd Stage :* Titration of complement. The complement of the guinea pigs obtained by "Pooling" the serum of at least 3 guinea pigs is first tested for its strength by being put up with antigen and incubated for half an hour in the water bath, when sensitised sheep cells are added to the tubes and the occurrence of the hæmolysis noted. The smallest dose of complement which brings on lysis is the hæmolytic dose.

*3rd Stage :* The antigen plus patients' serum plus complement in different dilutions are put up and incubated in the water bath for half an hour to enable complement to be absorbed by the antigen-amboceptor system. Four tubes are put up for each blood (Patients'). First tube contains 1 vol. of patients' serum plus 1 vol. of saline plus 3 hæmolytic doses of complement. Second tube contains 1 vol. of patients' serum plus 1 vol. of antigen plus 3 hæmolytic doses of complement. Third tube contains 1 vol. of patients' serum plus 1 vol. of antigen plus 5 hæmolytic doses of complement. Fourth tube contains 1 vol. of patients' serum plus 1 vol. of antigen plus 8 hæmolytic doses of complement.

*4th Stage :* Sensitised sheep corpuscles (5 per cent. suspension in normal saline) are then added to each tube and the series incubated for another 20 to 30 minutes in the water bath, at the end of which time the warm water is replaced with ice-cooled water to prevent putrefactive changes in the tube.

*The Wassermann Test—Reading of the Results* (*Fig. 5*).

With a strongly positive blood, tubes 2, 3 and 4 show no hæmolysis. A moderately positive blood shows hæmolysis in tube 4 but not in tubes 2 and 3. A weakly positive blood shows hæmolysis in tubes 3 and 4 but not in tube 2. A negative blood shows hæmolysis in all the four tubes. Tube 1 of each series is the control and always shows hæmolysis.

*Method of making cultivations for autogenous vaccines.*

Materials used for cultivations must be fresh and should be collected in a sterile manner. The media used should be the appropriate ones for the organism to be cultivated, *i.e.*, serum-agar for Gonococcus, blood-agar for pulmonary organisms, ordinary agar for staphylococci, etc. Material of the size of a mustard seed is enough for the purpose. This is taken on the bent tip of a sterilised glass spreader and evenly distributed by gentle stroking (without cracking the medium) on 3 or 4 slopes used without charging the spreader afresh for each tube. The first tube shows a very large number of colonies after incubation and each succeeding slope shows less and less so that an isolation of the causative organism is possible from the last tube.

*Preparation of autogenous vaccines.*

*1st Stage:* making the culture. The material is sown on the appropriate media, *e.g.*, agar-agar for staphylococci, B-coli, etc., serum-agar for Pneumococci, Gonococci, etc.; blood-agar for B-Influenza, etc. Incubation for 24 to 48 hours is carried out.

*2nd Stage:* The causative organism or organisms are transplanted from the original cultivations into fresh media for isolation and for obtaining pure cultures for the preparation of the emulsions.



*3rd Stage:* The preparation or the emulsions with saline solution and their sterilization at 56° C. for 30 minutes. 5 per cent. carbolic acid is added to prevent future contamination.

*4th Stage:* Standardisation of the emulsions with the standard opacity tubes of Barium Sulphate in citrated saline. This is done with the help of the table, the strength per c.c. of each organism being judged by the opacity.

*5th Stage:* The Vaccine emulsion is tested for its sterility by being planted on media both aerobically and anaerobically. Only when the emulsions are thus proved to be sterile the further stage of dilution is proceeded with.

*6th Stage:* Dilution of the Vaccine and its delivery into ampoules. In the case of compound Vaccines the emulsions of the different organisms are combined in the proportions required and then diluted before being transferred into sterilised capsules.

*The Widal test as carried out by Wright's method* (*Fig. 1*).

The different dilutions of patients' serum are put up with the emulsion of B-Typhosis in capillary tubes. The control with the salt solution shows no agglutination.

The Widal test may also be carried out in a single capillary tube (Fig. 2) or in glass tubes (Fig. 3). The serum is put up in different dilutions against B-Typhosus, B-Paratyphosus A and Paratyphosus B; in a series of tubes as before and the results read by the presence of absence of agglutination. The control in each series shows agglutination, the emulsion looking uniformly turbid.

*The Widal test by micr*

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## TREATMENT OF VE

(By Dr. M. A

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* A paper read before the Madras M

of the individual, collect all the data one can, if necessary do a Wassermann Reaction, and form an opinion on the data obtained. Having thus fortified oneself with the diagnosis, proceed to elicit the patient's history and if it tallies with the diagnosis arrived at, accept it as correct; if at variance with the diagnosis, reject the history as wrong always provided that the data gathered from the patient are sufficiently strong to warrant the diagnosis arrived at. This procedure applies to all venereal conditions.

The common classification of Syphilis into Primary, Secondary, Tertiary, and Post-tertiary stages has got to be revised in the light of recent findings. In this connection, I cannot do better than quote Sir James Purves Stewart. Says Sir James, " It is customary to classify syphilitic phenomena into Primary, Tertiary and Post-tertiary stages. This classification requires modification inasmuch as it has been recognised that gummata which were considered typically ' tertiary ' can occur within a few weeks after infection, during the so-called ' Secondary Stage.' "

A chancre is frequently called a hard sore. This is erroneous as a chancre need not be hard. Certain characteristics applied to the secondary syphilitic eruption are not always present. The copper colour of the rash would be difficult to make out in a normally copper-coloured individual. Absence of itchiness in a secondary syphilitic eruption is another misleadin gsign. In a hot country like ours, and with the type of patient we meet with in hospitals, it is almost the rule to find patients suffering from secondary syphilis, not mixed with scabies, complain of a certain amount of itchiness. Now,



this is easily understandable. The normal skin harbours many bacteria in its superficial layers, and with the skin almost always bathed in perspiration, the consequent soddening and peeling off of the epidermis, and warmth of the body, the necessary factors for the growth of these bacteria are forthcoming. What wonder then that these bacteria multiply and irritate, especially, in and around the crevices about the eruption, and give rise to a certain amount of itchiness? Provided therefore the itchiness is not a marked feature of the disease, it has to be considered as practically negligible.

*The Wassermann Reaction.*

A positive W. R. by itself does not indicate syphilis. Several other diseases give a positive W. R., notably Leprosy, Yaws, Relapsing fever, Malaria, etc. A positive W. R. can be attributed to syphilis only if clinical evidences of syphilis are present or if the patient gives a definite, reliable history of having had syphilis before. It is worthy of note that positive Wassermann Reactions have been obtained with the sera of individuals in whom absolutely no history or clinical evidences of the diseases which usually give a W. R. could be elicited.

A positive W. R. is due to the reaction of the tissues to the Treponema Pallida introduced into the system. The positive or negative character of the W. R. depends upon the presence or absence in the circulation, of antibodies to Treponema Pallida. Does the presence of antibodies to Treponema Pallida indicate also the presence of Treponema Pallida in the system? It is a well-known fact that immunity to a disease lasts for a variable time after the disease has been cured; and the duration of this immunity varies with different infections; and often to a

marked degree in one and the same infection. Might not this apply in syphilis as well? *A priori* a positive W.R. would merely indicate the presence of anti-bodies and not necessarily of Treponema Pallida. The latter may or may not be present at that time.

In those cases where the Treponema Pallida are not present in the system which gives a positive W. R. the following questions arise:—

(1) Is antisyphilitic treatment called for in such cases?

(2) If antisyphilitic treatment is carried out, would it adversely affect the immunity already present, as suggested by some writers, notably McDonagh.

I have purposely refrained from a consideration of the clinical value of the other tests, such as the Sachs-Georgi and Formol-Gel tests, as their superiority over the W. R. has not been established.

Again, how many intravenous injections of salvarsan have got to be given, and at what intervals consistent with the safety of the individual? One eminent authority recommends a first course of ten intravenous injections of salvarsan combined with mercury intramuscularly followed after a month's interval by another similar course if the W. R. continues to be positive. These courses have to be repeated, after one month's non-treatment period between every two of them until the blood gives a permanently negative W.R. Now, an observer working at the glycogenic function of the liver has found that the glycogenic function of the liver examined at the end of the first course of injections is found to be considerably below par, and that this function is not restored to normal until at least a period of 3 months has elapsed. I am not aware if this finding has been established by other observers. If



correct, it affords a very decisive explanation of the cause of the fatalities reported after intravenous arsenical medication. If a liver is already diseased on account of the first course of injections, the commencement of the second course long before the liver could return to its normal, must needs increase the degenerative changes in it and might possibly terminate fatally. The fatal complication of arsenical administrations could thus be easily accounted for.

*Treatment.*

Regarding the treatment of syphilis there are two schools of thought:—one school is guided solely by the nature of the W. R. and maintains that antisyphilitic treatment has to be carried on until the W. R. becomes negative and remains permanently negative; whereas the other school holds that antisyphilitic treatment has to be carried on until the manifestations of the disease have disappeared and blood gives a negative W. R., after which the question of further treatment would depend on the appearance of clinical manifestations of the disease, and not merely on the blood giving a positive W. R. Possibly these represent two extremes, and a *via media* is not easy to find.

The present-day treatment of syphilis can be summed up in three words:—Arsenic, Mercury, and Potassium Iodide.

Combined treatment by Arsenic (in the form of Salvarsan, Neosalvarsan, Stabilarsan, Silver Salvarsan, Sulfarsenol, etc.), Mercury and Potassium Iodide is the rule, arsenic being administered chiefly intravenously; mercury intravenously or intramuscularly; and Potassium Iodide orally. Before entering into the details of this treatment

I shall consider the several modifications that are employed.

*Modifications of treatment* are :-

(1) *Treatment by antisyphilitic serum of Query.*—Dr. Query of France proposes a serum from monkeys which have been inoculated with filtered cultures of Treponema Pallida on bouillon. When the serum of monkeys gives a strong positive W. R., the animals are bled and the serum collected and preserved in ampoules. This treatment in the hands of some is said to have proved effective in cases where treatment by Hg. and KI. and Salvarsan or Neosalvarsan had failed. In other hands, the treatment seems to have been far from satisfactory. One chief drawback is its prohibitive cost.

(2) *Treatment by intravenous injections of Hg. and Neosalvarsan combined.*—"Into a 10 cc. syringe, 6 to 8 cc. of warm water containing the desired amount of Neosalvarsan are aspirated and then 2 cc. of a one per cent solution of corrosive Sublimate. A dark green deposit forms, but this passes even a fine needle. To ensure proper mixture and thus prevent thrombosis, the syringe should be well shaken, preferably with a bubble of air inside it." This procedure is recommended by Linser of Tubingen who is alleged to have treated 1,000 cases and given 8,000 intravenous injections. Disadvantages said to be almost negligible W. R. said to become quickly negative and remain negative.

(3) *Intramuscular injections of Tartro-Bismuthate of Sodium or Potassium.*—A ten per cent solution of this salt in olive oil is made, and a quantity corresponding to 20 cg. of the salt is injected intramuscularly two or three times a week, gradually increasing the dose to 30 cg. so



that a first course of treatment lasting a month means the injection of a total of 2 to 3 grams of the salt. All the time the condition of W. R. is noted and when this becomes negative a few more injections are given as a precautionary measure.

Two chief drawbacks noted after this method are :—

(*a*) *Local reaction.*—In some cases sharp pains at the site lasting 2 or 3 days, sometimes accompanied by local redness and swelling and in exceptional cases by local oily collections which were spontaneously and rapidly absorbed. These are said to have been confined to patients who had walked shortly after an injection.

(*b*) *Impregnation of buccal mucous membrane.*—This is said to be almost constant. Dark line on gums, sometimes black patches on inside of cheeks, bluish tint of tongue ; mild stomatitis easily prevented and easily curable.

(4) Intravenous injection of Salvarsan followed by Spinal drainage.—This method is applicable in cases of Nervous Syphilis. I shall quote the procedure followed by Dr. Reginald Hearn.

"On the first day, the patient was seen, the cerebro-spinal fluid was examined. A week later, the patient was given a maximum intravenous injection of one of the salvarsan substitutes, and after a further interval of one week, the injection was repeated and immediately followed by drainage of the thecal canal. This method of alternate weekly injections and injections plus drainage was continued until a patient had received 8 injections and 4 tappings. In addition, most patients received one or more intramuscular injections of intramine

to intensify the action of the salvarsan subtitutes and to ward off metallic intoxication. The patient was then put on a KI. Mixture (with Hg. as well if case was meningeal) and the course repeated in 2 or 3 months' time if he felt no better or if symptoms returned."

(5) *Salvarsanized Serum Intrathecally.*—Applicable to cases of Nervous Syphilis. This method consists in injecting a salvarsan subtitute intravenously, drawing off about 20 cc. of blood thus charged with salvarsan, collecting the serum from it, and injecting the serum intrathecally.

(6) *Neosalvarsan injected in small doses directly into the Thecal Canal*—To revert to the routine treatment of syphilis. I do not want to touch on treatment by inunction of mercury which is the chief item in treating syphilis in some hospitals in Europe, for the simple reason that inunction has to be carried out by a specially trained staff and the so-called inunction we see done here is of no use to the patient. Hence, I shall consider only treatment by salvarsan or its substitutes and Hg. and KI.

Personally, I prefer to give mercury intravenously for the following reasons :—

(1) Cleanliness ; an intramuscular injection of mercury is obviously a dirty method ;

(2) Patient is rapidly brought under the influence of Hg. ;

(3) There is no risk of painful lumps developing, as frequently happens, in the case of intramuscular injections; and

(4) There is no risk of delayed mercurialism.



I have noticed that, sometimes, it may be months after treatment by intramuscular mercury has been stopped and the patient has been taking no mercury orally at all, signs of sudden and severe mercurialism supervene.

This can only be due to the fact that the unabsorbed mercury in the gluteal region having eroded a vessel wall is suddenly thrust into the blood stream with the concomitant signs of mercurialism. The only advantage of intramuscular over intravenous mercury is that the rate of absorption of mercury being slow the patient is kept longer under its influence than would be the case with intravenous mercury. But the disadvantages far outweigh the advantages of the method. Even after intravenous Hg. the influence of Hg. can be maintained by supplementing the injections with a course of oral administrations of Hg.

Under Hg. intravenously, I find that the primary and secondary stages of syphilis respond readily. The drug of choice for intravenous administration would be the cyanide of mercury which possesses a higher mercurial content and is more stable than the perchloride, and at the same time does not set up thrombosis in the blood-vessels which the perchloride is very likely to do. About 1 to 1½ cc. of a 1% solution in sterile distilled water is injected intravenously every other day. In the secondary stage small cases of KI. will in addition be necessary. This treatment may be carried out alone, or preferably may be combined with neosalvarsan.

Before giving an intravenous injection the bowels have to be cleaned out either by a purge or an enema. If 606 or 914 is to be given the patient should have had

a light breakfast about half an hour beforehand. This is important because, given on an empty stomach, arsenic is liable to be taken up by the liver cells and degenerative changes likely to be brought about, thereby. The same purpose is secured by administering 2 oz. glucose half an hour before an intravenous injection or by giving stabilarsan which is a glucose compound of salvarsan. It is also well to bear in mind that the maximum dose of 0. 6 grn. of 606 or 0. 9 grn. of 914 should seldom be given.

For the actual process of giving an intravenous injection of, say, Neosalvarsan, all that is required is a sterilised 5 or 10 cc. all-glass syringe and fresh boiled and cooled distilled water. The capsule containing the powder is filed off round the neck preferably after applying absolute alcohol to both the neck of the capsule and file. The required quantity of distilled water is drawn into the syringe and about 5 cc. ejected into the capsule. The solution of the powder being effected, the solution is drawn into the syringe with a very gentle pressure of the piston backwards. The syringe charged with the solution is now ready. Tr. Iodi is painted over any prominent vein, preferably of an upper extremity, a little above which either a ligature has been applied. or an assistant applies pressure by hands. If a ligature is applied it is important to see that the tying of the ligature is done when the veins are full. It not infrequently happens, with an inexperienced assistant, that the patient is made to hold his arm upward, and when the veins are only partially full a ligature is applied with the result that the veins do not stand out prominently. and if the subject happens to be a very fat individual practically no veins can be seen. A properly applied ligature, especially where fat persons are concerned, is as necessary for the success ot the operation as the skill of the operator.



With the arm of the patient prepared and the solution ready, all that is required is to plunge the needle into the vein holding it, at first, at an angle of about 30 degrees to the vein, and as soon as it is in the vein, bringing it parallel to it. As soon as blood appears in the syringe it is better to push the needle a little farther up in order to ensure complete catheterisation of the vein by the needle. For, it not uncommonly happens, especially with a beginner, that the eye of the needle enters the vein only partially, and if new injection is made, part of the fluid gets into the vein and part outside it creating a confusion in the mind of the injector who felt certain of having got into the vein by seeing blood in the syringe. Another common accident is transfixion of the vein. This is usually due to an insufficiently full vein or undue force applied by the injector.

A word about the preparation ot the solution for injection. If salvarsan or other drug belonging to 606 group is the drug of choice, solution is made in sterile distilled water and to this the required quantity of a sterilised 15% solution of caustic soda is added. The solution is filtered and may be given by gravitation method, diluted with about 200 cc. of sterilised normal saline or by "concentration" method, diluted to about 20 cc. by means of a 20 cc. syringe. I have found the latter method absolutely devoid of any risk to the patient. In giving 606 by "concentration" method care has to be taken that during the preparation of the solution the alkali added is not in

excess. Drugs belonging to the 914 group are simply dissolved in sterile distilled water as explained above and given intravenously.

The chief contra-indications for the use of salvarsan or its substitutes are (1) serious cardiac disease; and (2) serious kidney disease, neither of which is due to syphilis. If renal or cardiac disease is the outcome of syphilitic infection, arsenical treatment is indicated, but the dose will have to be small and repeated at frequent intervals. The other contra-indications usually mentioned in this connection may, unless sufficiently severe, be ignored for practical purposes. For want of time at my disposal, I need only refer you, for details, to the issue of B.M.J. of 1st July 1922.

In apparently intractable cases of syphilis it is well to bear in mind that other conditions might complicate the disease. The following case is worth mentioning to illustrate my point.

*A.B.*, female aged 25 years, was admitted for an ulcer on the labia. A punched-out ulcer with wash-leather sloughs was found on the inside of both labia-majora and minora. The inguinal glands were enlarged and shotty. W.R. strongly positive. Patient was put on Mercury Cyanide and Novarsenobillon intravenously and KI orally, the ulcer being dressed with perchloride of mercury gauze. The ulcer became gradually cleaner but refused to heal. It now presented characters typical of Infective granuloma. The patient was then put on Tartar Emetic intravenously and began steadily to improve. Unfortunately, at this stage, she had to be discharged from hospital as she became increasingly quarrelsome in the wards in spite of warnings.



This case raises one or two points:—

(1) Did the gummatous ulceration supervene in the course of Infective granulomatus ulceration? It is quite common to find, in persons with a previous history of syphilis, that a simple ulcer, due to a slight injury, for instance, refuses to heal and assumes syphilitic characters. In the case under review, the previous history of syphilis, and the large area involved by the ulceration would seem to support this view.

(2) Did the Infective granulomatus condition develop after the appearance of gummatous ulcer?

Certain cases again may present apparently typical signs of syphilis but may not be actually syphilitic. The following case appears to be of an unusual type and illustrates my point.

*X*, a Malayalee youth aged about 22 years, was admitted with psoriasis-like lesions over different parts of the body (flexor as well as extensor) including palms of hands and soles of feet. There was a general lymphadenitis present. Patient denied any history of syphilis. W.R. negative. As the clinical picture was fairly suggestive of syphilis an intravenous injection of 0·45 grn. Neosalvarsan was given. Within a couple of days the eruption became more profuse, and subsequent antisyphilitic treatment merely resulted in a severe dermatitis of an exfoliative type. Antisyphilitic treatment was then stopped and the patient given Intramine intramuscularly. After the first injection the eruption began to fade, and after the second, the whole eruption totally disappeared. This case illustrates that the non-syphilitic type of Psoriasis is not always confined to the extensor aspects of the body, but may, in rare cases, involve the flexor aspects and the palms and soles also.

The subject of visceral and nervous syphilis is so vast that, for want of time, I shall not enter into it now.

(2) CHANCROID OR SOFT SORE.

This subject need not detain us long as the only treatment necessary is to keep the parts clean by some antiseptic dressing. No constitutional treatment seems to be called for, although good results have been reported in such cases by the intravenous administration of Tartar Emetic.

(3) GONORRHŒA.

Gonorrhœa has to be considered under two heads:—

(A) Gonorrhœa in the male, and

(B) Gonorrhœa in the female.

A. *Gonorrhœa in the male.*—The causal relationship of the gonococcus to the disease need not be disputed in the present stage of our knowledge although some writers maintain that there is no specific organism like the gonococcus and what goes by that name is simply a degenerative form of the common pus-producing cocci. Until definite proofs of this view are forthcoming, we are bound to regard the gonococcus as a specific micro-organism.

The treatment of Gonorrhœa is an everyday affair with practically every medical practitioner. I shall accordingly touch on a few salient features of the disease.

The mainstay of treatment is the urethral irrigation; internal medication has proved of little value. In a case of anterior urethritis, washing out of the anterior urethra alone appears to be the view held by a large section, some holding that a urethro-vesical irrigation has to be resorted to even in such cases. In posterior urethritis, on the other hand, urethro-vesical irrigations must be given. For this purpose the patient is made to lie on his back on a table and the nozzle of an irrigator introduced



into the external meatus. The anterior urethra is first washed out. This done, the can is raised to a height of 6 feet from the level of the patient's hip. This head of pressure is necessary to bring about relaxation of the membranous sphincter. In a few minutes, or even more quickly if patient does not get nervous and co-operates by attempting to micturate, the sphincter dilates and fluid is admitted into the bladder. The entry of the fluid into the bladder may be ascertained by—

(*a*) percussion of the pubic region;

(*b*) placing palmar surface of fingers against ventral aspect of penis, when, if fluid is running into the bladder, a wavy impulse will be transmitted to the palpating fingers;

(*c*) noting the level of liquid in the can; and

(*d*) noting, if an air-bubble is present in the nozzle, fine waves of the liquid in motion.

Drugs to be employed for these purposes are legion: acriflavine, potassium permanganate and the silver preparations, perhaps, head the list. It is recommended to begin with potassium permanganate or acriflavine; and if the discharge persists in spite of the irrigations but repeated microscopical examinations of the discharge show a total absence of gonococci, the permanganate has to be replaced by a silver preparation.

In chronic gonorrhœa or gleet, the lesion usually is in the prostate. In such cases prostatic massage has to be carried out. This has a diagnostic as well as a therapeutic value. In order to carry out prostatic massage the bladder is filled with an antiseptic solution, *e.g.*, warm boric or potassium permanganate as in the case of a urethro-vesical irrigation; the patient is then placed in the knee-elbow position and the vaselined index finger introduced

into the rectum. The central and lateral aspects of the prostate are felt, the presence or absence of tenderness, swelling, etc., in these regions noted, and both the lobes massaged successively for about 5 minutes. It is important to massage both the lobes because gonococci may be present in one lobe while the other is apparently quite free. The discharge appearing at the meatus is either taken on a slide and examined microscopically or better still, collected in a conical glass containing water and examined microscopically. If by a preliminary prostatic massage the presence of gonococci is established, the operation is continued twice a week followed by urethro-vesical irrigations. The latter will have to be given daily in the intervals also.

The modern treatment of gonorrhœa is by means of the urethroscope. This instrument serves the double purpose of diagnosis as well as treatment.

*Vaccine therapy in Gonorrhœa.*—Gonococcal vaccine in acute cases appears to do no good. In chronic systemic affections of the gonococcus the administration of vaccine is useful to a certain extent. Improvement is noticed up to a certain limit and beyond that pushing vaccine therapy does not appear to improve the patient. I dare say this should have struck every practitioner and to quote cases would be mere waste of time.

*Intravenous therapy in Gonorrhœa.*—Of late, acriflavine has come into repute not only for urethro-vesical irrigations, but also for intravenous administration in cases of gonorrhœa. Intravenously about 100 to 300 cc. of a 1 in 1,000 solution of acriflavine in sterile normal saline are injected either by gravitation method or by an



all-glass syringe. The injection has to be repeated every other day. I have tried this method in two cases, in both of whom it has given satisfactory results. One case deserves mention:—*R*, a Hindu male aged about 30 years, admitted in January 1923, gave a history of gonorrhœa eight years previously; history of pain in the region of the right kidney and passage of blood mixed with urine for the past 7 years. Had virulent discharge at time of admission. No tube casts in the urine; diagnosed as Pyelitis of Gonococcal origin. The patient was put on urethro-vesical irrigation and hexamine and acid Sodium Phosphate by mouth. The discharge and the quantity of blood diminished, but pain in the region of the right kidney persisted and the patient's temperature also continued of a hectic type. Examination of the lungs showed tuberculous lesions at both apices. A sample of urine was sent to be centrifugalized and examined for Tubercle Bacilli. Result:—Tubercle Bacilli present.

Acriflavine ntravenously was begun. Patient had a first injection of 100 cc. of a 1 in 1.000 solution, 2nd of 150 cc., 3rd of 300 and a 4th of 100 cc. The urethral discharge totally disappeared, the quantity of blood passed very greatly diminished, the temperature dropped from between 102 degrees and 103 degrees to between 99 degrees and 100 degrees and his general condition was much better. It is obvious that the gonococcal infection had been decidedly acted upon by acriflavine, but whether this drug has any action on the Tuberculous process also, time alone can show.

B. *Gonorrhœa in women.*—Urethritis in the female is treated on the same lines as in the male.

In cases of cervicitis, etc. different methods are adopted, such as—

(*a*) applications of Silver Nitrate (15%);

(*b*) packing the cervix with gauze soaked in a solution of methylene blue, glycerine, and water;

(*c*) picric acid solutions;

(*d*) intramine pessaries;

(*e*) electrical treatment of the cervical mucosa, etc.

To enter into the details of these methods would take up a lot of time. The very multiplicity of the methods of treatment shows the uncertainty of the methods employed. Whatever the methods employed, treatment must be continued until repeated examinations of the cervical discharge show absence of gonococci.

(4) INFECTIVE GRANULOMA OR GRANULOMA INGUINALE.

This affection is far more common than one would suppose. Occurring in the preputial sulcus it is mistaken for chancre; occurring around the anal margin it is likely to be confused with condylomata, although usually occurring in the inguinal region, it may involve the face, lips, buccal mucous membrane, etc.

*Treatment :—*

(1) Excision.
(2) Tartar Emetic intravenously.
(3) X-rays.
(4) A combination of (2) and (3).

Excision would be the best procedure where practicable, failing which intravenous therapy by Tartar Emetic or preferably Sodium Antimony Tartrate gives very satisfactory results. In those cases where ulceration is attended with profuse large nodular growths which, owing to the development of fibrous tissue, prevent access of Tartar Emetic to the organisms of the disease, the process of healing is hastened by a thorough scraping followed by intravenous antimony. Sodium Antimony Tartrate



is preferable for intravenous medication as it is less depressing than the potassium salt. A 2 per cent solution of the salt in sterilised saline may de employed starting with a dose of from 2 to 3 cc. and gradually increasing the dose by ½ cc. or less depending upon the reaction of the patient, every other day or at least twice a week until a maximum dose of 6 cc. has been reached. Doses higher than 6 cc. of a 2 per cent solution are not well borne by all patients. Very rarely, therefore, would it be necessary to push the dose to 7 cc. It is a good plan to increase the dose by ½ cc. until 6 cc. has been reached. Repeat 6 cc. a few times, and then work backwards. 5½ cc., 5 cc., 4½ cc., to 4 cc. Give a few injections of 4 cc. and if the ulcer has not by this time completely healed, stop treatment for a fortnight and then continue the course. It is always best to have the Tartar emetic solution prepared immediately before the injection.

Intravenous medications may be combined with local applications of Tartar Emetic in the form of dressings. But in such cases the quantity of antimony absorbed is an uncertain factor. If the amount of antimony absorbed from dressings is large, signs of poisoning may develop. It is not possible to regulate the absorption of antimony *via* the dressings. Necessarily, therefore, the intravenous dosage will have to be very cautiously increased.

The presence of cardiac disease or fatty degeneration of the viscera would be a strong contradiction for the use of antimony. This reminds me of a female patient, suffering from Intective Granuloma who was given ½ grain of Tartar Emetic intravenously with very little reaction. As she had also had a fracture of the neck of femur, she

was transferred to the surgical wards where she was attended to and sent back to the venereal wards about 1½ months later. After readmission she had a second dose of ½ grain of Tartar Emetic intravenously. Whereas the first dose of ½ gr. administered 1½ months previously evoked very little reaction, the same dose given a second time gave rise to a very severe reaction which terminated fatally in 3 or 4 hours. P.M. showed extensive fatty degeneration of all the viscera which obviously acted as the proverbial last straw.

In conclusion I need only state that the omission or lack of adequate treatment of certain aspects of the venereal disease problem was merely due to want of time at my disposal and by no means to the lack of importance of the subjects concerned. It is also but just to mention that in the treatment of the subject I have drawn freely from current literature on venereal diseases. Finally, I must express my thanks to Major W. C. Gray, I.M.S., Superintendent of the Government Royapuram Hospital, for kindly permitting me to quote the cases referred to above.

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## SOME ASPECTS OF ABDOMINAL SURGERY IN INDIA—II.

(By Dr. N. S. Narasimhan, *Surgical Registrar, Government Royapuram Hospital, Madras.*

### *Acute Intestinal Obstruction.*

"The following are the chief causes which give rise to this condition :—(1) Strangulation by bands or adhesions or through apertures, etc. (2) Volvulus. (3) The impaction of foreign bodies. (4) Strangulations over a band or acute kinking of the gut, both very rare conditions. (5) Acute intussusception. (6) It may be the termination of a chronic obstruction. (7) Acute localized paralysis of the gut due to an infective inflammation, *e.g.*, accute suppurative appendicitis. (8) Acute enterospasm."



The following are the figures for Government Royapuram Hospital for the years 1916, 1917, 1918, 1919, 1920:—

*Number of cases.*

| | 1916 | 1917 | 1918 | 1919 | 1920 | Total. |
|---|---|---|---|---|---|---|
| Strangulated Hernia .. | 6 | 9 | 11 | 13 | 6 | 45 |
| Deaths .. .. | 1 | 2 | 3 | 1 | 2 | 9 |

Death rate 20%

Number of cases on which radical cure was done .. 34
" " Herniotomy was done .. 5
" " Reduced by taxis .. .. 6

Excision of gut and end-to-end anastomosis done in 1 case.

Operative mortality was 23·09%

The death rate between 1836 and 1841 of 183 Herniotomies in Paris was 62·2 %. Between 1869 and 1888 of 283 Herniotomies for strangulated inguinal hernia in four London Hospitals, 59% died.

| Hospital. | Inguinal. | | | Femoral. | | | Umbilical. | | | Obturator. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Died | % | No. | Died | % | No. | Died. | % | No. | Died. | % |
| St. Thomas 1907 | 111 | 21 | | 103 | 24 | | 30 | 14 | | 2 | .. | |
| Middlesex Hospital 1907 | 37 | 8 | | 29 | 3 | | 11 | 8 | | 3 | 3 | |
| Royal Infirmary 1900-12 | 119 | 22 | | 96 | 14 | | 11 | 2 | | .. | .. | |
| Total .. | 267 | 51 | 19 | 228 | 41 | 18 | 52 | 18 | 34·5 | 5 | 3 | 60 |
| Government Royapuram Hospital. 1916-1920 | 39 | 9 | 23·09% | Nil. | | | 1 | 1 | 100% | .. | .. | .. |

The non-occurrence of a single case of Femoral Hernia strangulated or otherwise for 5 years is a fact to be noted.

*Intestinal Obstruction.*—"The commonest way for Volvulus formation in India is by large powerful purgative which induces violent peristalsis and the gut gets twisted . . . intussusception is rare in India.".

"The incidence of intestinal obstruction for 5 years in Madras General Hospital.

Strangulated Hernia .. 152 Deaths .. 37
Intussusception .. 2 Died .. 1

Internal strangulation 2. Volvulus, 2. By bands 1. Acute obstruction due to cancer-rectum, 1. Causes not given, 13. Fæcal impaction, 1.

Number of cases of intestinal obstruction for 3 years in this hospital.—68 cases; 58 were operated.

*Classification.*—Strangulated Hernia (33 inguinal and 2 umbilical). Intussusception of lower end of ileum 9. Volvulus of Sigmoid 8. Volvulus of ileum 1. Ext. Bands and adhesions tuberculous 1. Ext

Bands and adhesions not tuberculous 2. Embolism of mesenteric vessel 1. Pack of worms 1. Cause not known 1. Refused operation 13.

It will be seen from the above two classes of cases (G. H. and G. R. H.) amounting to 230 as compared with the cases of Flint (282) given below that Femoral Henia is singularly absent, bands and adhesions from only 4 and that by Tub. condition only one. Meckel's diverticulum singularly absent (one case was met with in 1922), intussusception only one. Volvulus was very common, carcinoma of intestine met with in only one case.

Volvulus is reported to be more common in Russia (De Quervain).

Barry writes, "intussusception of the bowel is a rare form of intestinal obstruction as met with in the practice of Rangoon G. H. Such cases as have been met with have occurred chiefly amongst adults in an experience of some nine years at this hospital. I can only recall one case occurring in an infant, and although doubtless cases occur amongst infants, which are allowed to die untreated, still I feel sure this form of intestinal obstruction is rare. Fitzwilliams in the *Lancet* of March 1908, urges the view that intussusception in infants is caused largely by errors of diet. He states, "It is a matter of interest from the point of view of the possibility of a too generous diet being responsible for the condition to note the intussusception occurs almost without exception in fat, well-developed and healthy children and that in 31 cases in which it was possible to obtain a history of the cause, in 25 what may be termed errors of diet were mentioned, the remaining nine were due to mechanical causes." In Germany where breast-feeding is far more general and more strictly carried out than in England, intussusceptions in infants are relatively rare: the same condition largely holds good in Burma. Every mother unless incapacitated by illness suckles her child, and continues to do so often for 2 or 2½ years. It would appear then possible this may be the reason for comparative rareness of intussusceptions amongst infants in this country."

In recording 3 cases of volvulus during the year (20, 35 and 60 years of age) he says, "In my opinion the number of cases of this form of obstruction has been unusually few this year; for volvulus is a fairly common accident amongst natives (especially natives of India) in this town. Except for rare instances in which the small bowel has been involved the variety met with has been invariably that affecting the Sigmoid flexure.

"In cases of intestinal obstruction in natives of the East, it is often most difficult to form a correct estimate of the patients' condition; both the pulse and the aspect of the patient are untrustworthy. It is wiser to look on intestinal obstruction in a native as a much more severe illness both generally and locally than a similar catastrophe happening to a European on account of the risk of Post-operative gangrene."



*Acute intestinal obstruction.*

Imperforate anus 2. Intussusception 2. Volvulus 3. Organic stricture 1. By bands 3. By bands followed by resection of gut 1.

*Intestinal obstruction in infants.*—Frederick Langmead (Med: annual for 1921), G. M. Bullows and R. E. Brennan record an extraordinary case of intestinal obstruction due to inspissated and impacted meconium. The baby was born by a normal labour, and nothing abnormal was noticed except that the abdomen was slightly distended. Twenty-four hours later it was reported that she had passed no meconium. No masses could be felt in the abdomen, but some definite resistance was encountered in the right upper quadrant. The rectum revealed a small dimple about 1" above the anus, through which small amount of sebaceous material oozed. Next morning the temperature had risen to 102 degrees, and the abdomen was tense and swollen, and the knees were drawn up. Laparotomy was performed and a considerable amount of free fluid evacuated. The coils of the small intestine were injected, covered with fibrin, much distended, and through their thin walls meconium was visible. The large intestine, 1 c.m. broad, was totally collapsed, but had a perfect lumen: it contained more of the same whitish sebaceous material which had been seen per rectum. An ileostomy was hurriedly performed, and the child died 5 hours later. The intestinal blockage was found to be due to impaction of the white inspinated and stratified contents. There was no gross abnormality of the bowel. The authors find no record of a similar case.

In 1922 there was a similar case in this hospital in a baby 3 days old; rectum was patent; an exploratory laparotomy showed meconium in the peritoneal cavity; a colostomy done; the child died shortly after; no post-mortem was obtained.

A series of 282 cases of acute intestinal obstruction has been dealt with by E. R. Flint, in *British Medical Journal* of May 21, 1921. Mortality in this Series was 15·6%.

| | No. of cases. | Deaths. | % |
|---|---|---|---|
| 1. Ext. Hernia .. | 170 | 18 | 10·5% |
| 2. Bands and adhesions .. | 39 | 10 | 25·6% |
| 3. Intussusception .. | 26 | 10 | 38·4% |
| 4. Carcinoma of intestine .. | 42 | 6 | 14·6% |
| 5. Volvulus .. | 2 | 0 | |
| 6. Int. Hernia .. | 1 | 0 | |
| 7. Thrombosis of elenteric vessels .. .. | 1 | 0 | |
| 8. By gall stone .. .. | 1 | 0 | |

The mortality of all cases not requiring resection in this series was 9·3%, *i.e.*, 236 cases with 22 deaths.

There may be one Land causing obstruction; in this series there were 2 such cases.

The mortality of all resections was 4·51%.

presupposes a condition in which it has been subjected to traction for a considerable time, such as long detention in a hernial sac or the pull of an intestinal tumour."

Notes by F. P. Connor of 85 cases of consecutive strangulated inguinal hernia:—Of 85 operations done in 3 years, 82 were inguinal and 3 were femoral hernia. In this series there were six in which cæcum formed part of the contents of the hernial sac, *i.e.*, 7% as compared with 25·5% in Capt. Thurston's series. Even these figures, however, are much higher than the 2% or 3% given in most statistics of European cases, and go still further to prove that the more bulky and freely moveable cæum of the Indian is more liable to stray into a hernial sac than the European cæcum. In more than half of these cæcal herniæ, the prasence of cæcum in the hernial sac was not due to any congenital tendency as far as could be judged but was due to excessive mobility."

Major C. Barry (I. M. G., February 1916) analyses 47 cases of intestinal obstruction and the causes are:—

| | | | |
|---|---|---|---|
| Volvulus .. .. | 11 | Internal hernia .. | 1 |
| Intussusception .. | 8 | By Meckel's Diverticulum | 1 |
| Organic stricture .. | 4 | Impacted worms .. | 2 |
| Bands .. .. | 20 | | |

One-third of the cases of bands occurred in female patients, a point of interest when considering how rarely intestinal obstruction from hernia has been met with amongst women. All the cases of volvulus occurred amongst males and with the exception of two cases amongst patients over 40 years of age. Of intussusception, six cases occurred in males, two amongst females, no case has been met with under the age of 20 years. This experience is peculiar, for intussusception is generally considered to be an affection of childhood and youth. In all experience extending over 18 years at this hospital we cannot remember ever having been called on to treat a case of this nature amongst native children; a few cases have occurred amongst European children, but not amongst native children. Though native mothers may be reluctant to bring children for treatment, cases should have been seen, as about 6,000 children attend in a year both in and out patients for 18 years. The cases of intestinal obstruction due to organic stricture were of the nature of an acute one grafted on to chronic obstruction; one case was the result of a cancerous growth of the rectum and the other two were both due to localized strictures of the sigmoid flexure which were thought to be of syphilitic origin and which certainly had none of the characteristics of cancer. Though cancer of the pylorus and of the rectum have occasionally been met with amongst native patients, the variety of cancer of the intervening portion of the intestinal tract amongst the people is a matter of great interest.

Out of 4,161 consecutive post-mortem examinations held on natives during the last five years the following cases of cancer of the intestinal tract is met with:—Of stomach 4; rectum 1; œsophagus 1; sigmoid flexure 1. Again out of 1,782 Laparotomies performed in natives at this hospital for all causes during the last 5 years cancer of the rectum was met with twice and cancer of the stomach 14 times. No case of cancer of the small intestine, cæcum, colon or sigmoid flexure was operated on or discovered, though during the same time cæcum was excised 5 times for tubercular disease.



In the experience of English hospitals 27% of all cases of intestinal obstruction owe their origin to cancer of the intestinal tract, the middle portion of which is by no means immune; . . . in English patients, "those portions of the intestinal tract most frequently affected correspond with the positions where investigation has shown that stasis of intestinal contents is to be expected." It is our belief that stasis is uncommon amongst natives, since the native is largely a vegetarian, adopts squatting posture during defæcation and is careful as regards the evacuation of the bowels by one or two daily motions.

## GLEANINGS.

### INSULIN.

That the internal secretion of the pancreas contained a harmone necessary for the complete metabolism of carbohydrates in the body was long known. It was also known that this internal secretion came from the islands of Langerhans. The isolation of the substance was difficult since it was easily and quickly destroyed by trypsin and other proteolytic enzymes of the pancreas.

The difficulties have, it is stated, been now overcome, thanks to the labours of Banting, Best, Macleod and others of America; and the Antidiabetic hormone which is called 'Insulin' is now prepared by a process of fractional precipitation with alcohol from pancreases of animals. The various steps in the manufacture of the substance have to be carefully watched and the standardisation has to be scientifically controlled by experiments on animals. It is for these reasons that the Medical Research Council of England, who have the sole monopoly for the preparation and distribution of this valuable therapeutic agent, have entrusted the task of preparing the substance only to a few well-known firms.

The true nature of the substance is yet unknown. It is a white powder soluble in water and alcohol. Actual boiling destroys its value in three minutes. It should be given hypochemically and is of no value when given by mouth, as it is destroyed by trypsin.

*Dosage.*—Amount of Insulin which reduces blood-sugar of a fasting rabbit of 2 kg. weight to 0·045 per cent. (*i.e.*, half its normal) in about 1 to 3 hours is taken as one unit. This one unit (English, new style) is equivalent to three or four old style American units and is generally put up in 1 cc. When sugar is reduced to this level the rabbit develops symptoms of hypoglycaemia. These are excitability, fear, hunger, and finally convulsions. All these can be stopped by injecting glucose subcutaneously or intravenously.

*Group 2.*—12 were the result of bands and adhesions due to the presence of tuberculous mesenteric glands, 9 to bands not of tuberculous origin, 4 to Meckel's diverticulum acting as a band, and 13 to adhesions resulting from previous operations, 2 of these occurred during the first few days after appendicectomy with drainage. It is interesting to note that when adhesions caused the obstruction, this appeared to result from a rotatory effect given to the intestine rather than from kinking. Volvulus cases were both of cæcum.

Int. Hernia was through a hole in the mesentery.

(1) *Ext. Hernia.*—170 with 18 deaths; mortality of 10·5%; 50 were inguinal, with the strangulation at ext. abdominal ring in at least 40; it was only found in int. ring in 5; there were 3 deaths; 98 were femoral, with 11 deaths; 18 were umbilical with 4 deaths.

Hey Groves says, "intussusception causes one-third of all cases of intestinal obstruction," while Niblock says, "It is rare in India."

I have met with 3 cases of intussusception in the past three years in adults, in medical wards, one diagnosed in the post-mortem examination and two refused to get themselves operated. I have seen one case of chronic cæcal intussusception in Bombay.

Capt. E. Owen Thurston, I.M.S., Oct. I.M.G., 1910, analyses 61 cases of intestinal obstruction; of these, volvuli were 18 (small intestines 10, sigmoid flexure 6, cæcum 2), adhesions and bands 9, intussusception 33, carcinoma of rectum 1, *i.e.*, more than 50% are volvuli of one description or another. Treves, out of 1,000 fatal cases of intestinal obstruction, gives the varieties roughly as intussusception 350; bands and apertures 250, stricture 150, tumours and foreign bodies within the bowel 100, fæcal accumulation 60, volvulus 50, tumours, etc., external to the bowel 40, and goes on to say that the above is misleading as only the fatal cases are dealt with.

Langdon says (*Annals of Surgery*), 1900, "In 1,000 operations for acute obstruction and gangrenous hernia, it was found out that of 646 cases of obstruction 121 of volvuli and remarks that the proportion seems too large, certainly for practice in New York city, but that the references to it in Russian and German literature are very frequent."

Kuttoner had called attention to the fact that a geographical predisposition exists. "In Russia the length of the small intestine is greater than the normal, owing probably to the coarse vegetable diet. Konig estimates the length of the German small intestine at from 17—19 feet and the Russian from 20–27 feet. I have been unable to find any records of the measurements of the intestine in the inhabitants of Bengal, but think it extremely likely that it would be found that the length of their small intestines would be above average owing to their being largely vegetarians." In a previous paper I put forward the view that the increased weight and bulk of the fæces might be the factor in the causation of frequency of cæcal hernia.



Corner and Sargeant were only able to find 57 recorded cases of this condition.

In writing in 1910 on strangulated inguinal hernia Niblock stated.—"I have seen 4 cases in which volvuli of the small intestine was the cause of the obstruction, one in the operating theatre and three in the post-mortem room; in the latter the reduction by taxis has been carried out."

F. De Querain writes, "There is a geographical distribution which points to volvulus as the diagnosis of the form of intestinal obstruction. In most countries neither the student nor the surgeon sees many instances of this condition, but in Russia, especially in Baltic States, volvulus in the most frequent variety brought into the hospital. Guber states that this is due to the greater length of the Russian intestine; others attribute it to the abundant dietary of potatoes. I know many places where the potato is a great favourite, but where volvulus is almost unknown. Guber's view is also stoutly contested. Indeed, volvulus is more likely to be due to congenital or acquired abnormalities in the mesentery, which permit a more extensive movement of some parts of the intestine, than to the length of the bowel in metres. To allow of the twisting of the bowel, the coil requires a certain amount of independence which is given to it by a long mesentery with a narrow attachment, the same factor would also tend to cause elongation of the mesentery. According to Monks, generally speaking the longer the intestine the longer the mesentery and *vice versa*. With a long mesentery the liability to volvulus is increased and considering that the average stature of the Bengali is below that of the European, the root of the mesentery would probably be shorter and this combined with a lengthy mesentery would still further increase the liability to the formation of a volvulus. There are no exact observations in India, but measurements of cadavers in the condition, they are usually brought for post-mortem examination would be of practically no value. In the above cases there seems to be no regularity in the direction of the twist, *i.e.*, from one side or the other. Several cases gave a history of having indulged before the onset of symptoms in a hearty meal of the most indigestible materials and this often appears to be the exciting cause. The two cases of volvuli of the cæcum are interesting on account of their rarity.

"Such a condition is only normal in Sigmoid, and it can be increased by the greater development of the coil or by the abnormal approximation of its lower extremity. Sometimes, the ileo-cæcal segment is provided with so profuse a mesentery that it occasionally twists about on its long axis. Finally the whole of the small intestine, either itself or with the large intestine, may possess such a narrowly attached mesentery that the whole bowel is capable of twisting in its entirety. The occurrence of torsion in a single coil of small intestine

presupposes a condition in which it has been subjected to traction for a considerable time, such as long detention in a hernial sac or the pull of an intestinal tumour."

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Human dose is anything from 10 to 30 or even more units depending on the severity of the case. In cases of severe coma a quantity up to 100 units in 24 hours can be given.

The drug can be given intravenously also. *Dosage must be carefully controlled by blood-sugar estimations from time to time. Symptoms of hynoglycaemia may develop at any time if the dose is large.*

These set in from one hour to a few hours after injection and consist of flushing, giddiness, local sweating, a sense of constriction about chest and abdomen and finally convulsions and collapse. They seem to be of nervous origin and to depend on the diminution of sugar in blood circulating in brain. If treated by administration of sugar or glucose they promptly disappear.

*The best time* to give injection is from $\frac{1}{4}$ to $\frac{1}{2}$ hour before meals; and two injections a day before breakfast and dinner will do. Patient should consume a large carbohydrate diet after injection.

*The effects* when given in proper dosage are stated to be quickly seen. The reports, so far available, are to the effect that the patients begin to feel well very quickly and that the sugar and ketone bodies become less and finally disappear from urine. Blood-sugar also becomes normal. Patient has a feeling of well-being, becomes active and energetic and begins to put on weight rapidly.

Unpleasant symptoms are stated to be much more easily produced in cases of mild diabetes than in severe types.

In cases of coma, 20 to 30 units may be given at once and repeated in a few hours, if no improvement occurs.

*Precautions.*—No case should be subjected to treatment by insulin unless blood-sugar estimation has been made and the case ascertained to be one of true diabetes with hyperglycaemia. Cases of glycosuria without hyperglycaemia (so called renal glycosuria) should not be treated by the drug. Whenever used, its use should be controlled by frequent blood-sugar estimations.

Patient should be under control specially with regard to his diet. He may be advised to carry some sugar with him so that he may consume some, if he feels bad.

It should be remembered that the *treatment by Insulin does not replace dietetic treatment but is a very important adjunct to it.*

*Pituitary extract.*—Hormone of the posterior lobe of the pituitary and Insuln appear to be antogonistic. A dose of pituitary extract will effectively prevent a fall in blood-sugar—concentration produced by a dose of Insulin, or remove the effects of such a fall if it has already occurred.

As Insulin has been made available in the Madras market only very recently, it is still too premature to report on the results of our own trials; but, our readers will, it is hoped, be interested in the following narration of British and American experience:—

"*The use of Insulin.*—Report to the Medical Research Council (*Brit. Med. Journ.*, p. 237.)—Insulin has been used clinically at eight hospitals for about 3 months. The number of diabetics treated has been small, less than 50, and included only seven cases of coma. Except in the cases of coma the patients have all shown



admirable improvement. The blood sugar falls rapidly as the temporary result of each injection, and sugar may be prevented from appearing in the urine even on a diet so generous as to be three or four fold as great as that which the patient could previously tolerate. There is a steady increase of weight, with a sense of greater warmth and energy. The phenomena usually ascribed to deficient metabolism of fats are especially influenced. Acetone vanishes from the breath and aceto-acetic acid from the urine; lipæmia disappears; acidosis and dyspnœa are at once controlled.

No substitute has yet been found for the hypodermic method of giving insulin. The injections have to be repeated at least once each day. They can control all the ordinary phenomena of diabetes, but the effect of each injection is only transient. As yet there is no evidence—time has hardly allowed of that—to show that diabetes in its most serious forms can be cured by insulin. It may be that the great majority of severe cases cannot hope for more than prolongation of life, with greater strength and ampler dietary, but only at the cost of continuous treatment with insulin.

The insulin is procured by alcoholic extraction of pancreas from the abattoirs in a state of relative purity, and is put up in sterile watery solution with a trace of antiseptic. Ampoules of solution should be kept in cold. The injection should be made with a fine needle, preferably under the skin of the upper arm. A slight tingling or discomfort may be caused for a few minutes.

The unit dose is not measured by reference to the weight of substance taken into solution, but by determining the volume of final solution required to reduce the blood sugar of a 2-kilo rabbit under standard conditions to about 0·04 per cent., at which level convulsions appear. Three units, as at present defined, produce this effect in a rabbit. The average dose for an adult is 10 units.

In a healthy subject, starved for 15 hours, 30 units will cause in less than half an hour a fall of blood-sugar which progresses for about three hours. The fall may be from the normal of about 0·12 or 0·1 per cent. down to 0·06, near which level serious features of sugar deficiency are likely to appear. A larger dose of insulin is required to produce this critical fall in the healthy, where the liver is full of stored glycogen, than in emaciated diabetics. In the latter a rapid fall in blood-sugar and the development of hypoglycæmic features occur much more readily. The similarly produced insulin hypoglycæmia in a rabbit is attended by convulsions, coma and muscular flaccidity. The rabbit remains apparently moribund, and may die in an hour or two; but intravenous injection of glucose solution in a couple of minutes restores it to apparently normal. Subcutaneous injection of glucose solution is equally effective, but slower. Insulin hypoglycæmia in man can be checked at once by administration of glucose, but it should be avoided by carefully attending to the time when insulin is given in relation to food.

Insulin should never be given during periods of abstinence from food. Glucose reaches the blood soon after a meal, and continues to do so from 2 to 4 hours. The effect of insulin lasts for a period up

to 8 hours, but there is little danger of serious features developing after the fifth hour. Therefore each injection should be followed by a meal in about a quarter of an hour, and fresh food should be given every 3 or 4 hours subsequently until the insulin effect has passed beyond such activity as might reduce the blood sugar to a seriously low level. It is obviously safer to give two small doses at fully spaced inrervals rather than one large dose daily, and a large dose should never be given in the evening, for serious changes might arise unnoticed during the time of sleep and abstinence from food. One unit of insulin provides for the efficient consumption of 2 grams of carbohydrate in a completely diabetic patient, Protein food contains nearly half its weight of potential carbohydrate, so that the same dose of insulin should provide for at least 4 grams of protein. But the carbohydrate from protein enters the blood much more slowly than does that of carbohydrate taken directly as such. Moreover, diabetics vary in the amount of insulin required to cover the food taken, while even the individual may vary from time to time. It is therefore impossible to state the doses needed in respect of any scale of diet. Each patient must be tested and the dosage subsequently watched for possible changes in the amoun tneeded.

The reaction, which usually appeared 3 or 4 hours after insulin injection, often began with a sense of weakness, sometimes associated with free perspiration. Faintness. dizziness, and mistiness of vision were added; and the patient might either feel drowsy or show intense anxiety from the sense of rapidly advancing and overwhelming weakness. The nervous reflexes were simply depressed, but not otherwise changed. The blood sugar was then usually down to 0·06 or 0·05 per cent. Prompt recovery in 10 or 15 minutes was easily obtained by giving glucose from 10 to 20 grains. or about ½ oz., drunk in 3 or 4 oz. of water. Cases that through lack of proper vigilence might have been allowed to pass into unconsciousness would require subcutaneous or intravenous injections of glucose solution (5 per cent. in normal saline). Milder cases at the onset of collapse can be treated by cane-sugar. Glucose is essential only for intravenous injection.

If insulin be given in such amounts as to keep the urine free from sugar, the dosage must be frequently checked by blood sugar determinations. For all cases under insulin treatment glucose or cane sugar must be kept ready at hand, so that a small quantity may be given as soon as any premonitory symptoms of hypoglycæmia are noticed.

The instructions drawn up by the Committee advising the Ministry of Health upon the use of insulin require that there shall be no luxury use until supplies are abundant. Mild cases of glycosuria or diabetes are therefore excluded, and with these would automatically be classed those cases (renal glycosuria) where sugar is present in the urine for 3 or 4 hours after food, owing to excessive permeability of the kidney, though the blood-sugur is not raised above normal and the patients remain in good health. Whenever insulin becomes available for mild cases care must be exercised to exclude



cases of renal glycosuria, since dangerous hypoglycæmic collapse would probably result.

Ordinary diabetics should first be put on a restricted diet with some periods of starvation, as by the Allen or Graham procedure. If the diabetes is not of long standing and the patient not greatly wasted, this treatment would probably suffice, or might need only slight assistance later with insulin. But if the disease is of long duration, with proved excess of blood-sugar, and the patient fails after starvation to tolerate any diet of less value than about 1,000 calories in 24 hours, so that strength and weight continue to fail seriously, then insulin should be given systematically. The cases treated at the research centres have all been of this severe type.

Insulin acts simply as a temporary instrument to enable a diabetic to eat more food than he could previously tolerate without the appearance of sugar or acetone bodies in the urine and without a rise in his blood-sugar. Each dose enables him to get more energy out of the food and to increase the reserve stored up in his tissues, as shown by increase of weight. Only a progressive increase of weight over several weeks was accepted as proof of tissue increase, for there was reason to believe that part of the increase was due to increased retention of water.

The following cases show the doses of insulin needed in severe cases:

A woman, aged 56, with steadily progressive and very severe diabetes. During the last 18 months repeated dietetic treatment in hospital, at first with immediate success, but ultimately tolerance could not be established on any diet sufficient to maintain life. After 5 days' continued starvation, the urine became sugar-free. The subsequent tolerance was for a diet of only 190 calories in 24 hours.

By administration of 60 units of insulin daily she could tolerate 1,350 calories daily, with 80 grams carbohydrate, and her weight was raised in ten weeks from 5 st. 10 lb. to 7 st. During the day the urine was sugar-free and contained no acetone bodies on this diet; but each morning the blood-sugar was over 0·4 per cent., and the urine contained sugar and a trace of ketone from the failure of her own unaided metabolic processes during the night.

Male, aged 18, with severe diabetes for 3 years. On a diet of 600 calories, containing 20 grams carbohydrate, he excreted 30 grams of sugar daily. With insulin, about 12 units daily, he could tolerate a diet of 1,400 calories daily, containing 48 grams carbohydrate, the urine being sugar-free and the blood-sugar below 0·2 per cent. His weight and strength steadily increased.

The doses in severe cases may be from 10 to 20 or even 30 units twice a day, or a smaller amount divided between three doses. Such patients ought to be treated at first in special institutions, where the diet can be closely controlled and the blood-sugar frequently determined. If, after treatment has commenced, only one measurement of the blood sugar is made occasionally, it should be from a sample taken at the same hour and 3 hours after the injection and the consumption of a meal directly related to that injection. With such

precautions it may be possible to give enough insulin to keep the urine entirely sugar-free, and that condition would seem to be the ideal aim when hopes of ultimate cure or real amelioration are entertained. The essential principle in the treatment of diabetics by diet control alone has been generally recognized to be avoidance of hyperglycæmia and glycosuria, so that the intrinsic powers of carbohydrate metabolism may be slowly regained in the long period of comparative rest from overstrain. Insulin ought to aid this rest period. But if insulin is given in such amounts as to prevent the appearance of sugar in the urine, there are no means of estimating the full effect of the dose except by watching the blood-sugar. If the latter cannot be done sufficiently often it is probably safer to avoid the danger of hypoglycæmic collapse from too much insulin by reducing the dose to such a level as will just allow slight glycosuria as a safety gauge. The patient will put on weight and recover strength, though on a road that may not be the shortest to cure.

TREATMENT OF COMA.

Only 7 cases have been treated, and they fall into two groups:

1. *Post-Operative Coma.*—In 3 cases coma in diabetes followed surgical operations. The blood-sugar during the coma was very high, from 0·7 to 0·8 per cent.; air-hunger and dyspnœa were not conspicuous features. There was but little acetone in the breath and not much aceto-acetic acid in the urine. The cases were therefore of coma with great hyperglycæmia, but not with severe ketosis. No improvement was obtained with insulin, though only in one case was the substance given in sufficient amount to reduce the blood-sugar, and it is therefore only in the latter that failure need be admitted.

2. *Ordinary Diabetic Coma.*—In 4 cases treated there was a much lower blood-sugar, 0·3 to 0·4 per cent., but greater air-hunger, with depression of the alveolar $CO_2$, and abundance of ketone bodies in the urine. These patients showed ketosis rather than hyperglycæmia, and 3 were strikingly improved by insulin.

A man was admitted to hospital on the verge of diabetic coma, being just conscious, and with extreme air-hunger, as shown by the respiratory movements of abdomen and chest. The blood-sugar was 0·33 per cent., a figure often seen in ordinary diabetics while in fair health; but the alveolar $CO_2$ was 1·1 per cent., so low that, in the experience of the physician in charge, it always meant death within about 12 hours, for he had never seen recovery with alveolar $CO_2$ below 1·8 per cent.

Insulin, 18 units, was given; and abundance of water (15 oz. hourly), with sodium bicarbonate, 2 drachms by the mouth every 2 hours for 3 doses. In 2 hours the patient began to feel better, and his air-hunger was lessening at the third hour. At 6 hours the blood-sugar was 0·11 per cent. and the alveolar $CO_2$ had risen to 2·7 per cent. The patient recovered and now has a morning blood-sugar of 0·15 per cent. on 12 units daily of insulin, and a diet of 53 grams protein, 105 grams fat, and 16 grams carbohydrate in vegetables. There has been no glycosuria for 8 weeks.



A woman of 25, in coma, with air-hunger, acidosis, and blood-sugar of 0·4 per cent. She was given insulin subcutaneously, 10 units every three hours; at the same time fluid was given freely and glucose solution both intravenously and subcutaneously. The blood-sugar was thereby raised to the very high figure of 1 per cent. The patient recovered.

The last case raises a paradox. Sugar is sometimes given with insulin in diabetic coma to prevent the comatose state from being aggravated by hypoglycæmic collapse Now, it appears that coma may arise when the blood-sugar is not unusually high, and also that the patient may emerge from coma though the blood-sugar has been raised by added glucose to 1 per cent. On the other hand, post-operative coma with high blood-sugar was not improved, though the blood-sugar was reduced to 0·4 per cent. by insulin. The percentage, therefore, appears to bear no direct relation to the coma.

It is, however, impossible to neglect a comparison between the states of diabetic coma and hypoglycæmic collapse. The latter is an entirely novel conception that has come into pathology through experience with insulin. Hypoglycæmic collapse is caused by the artificial lowering of the blood-sugar to half its normal level, and is at once relieved by giving sugar. The brain is therefore as sensitive to the withdrawal of sugar as to sudden diminution in its oxygen supply. It may be that one aspect of the picture of diabetic coma is due to the final inability of the brain cells to consume sugar, even though presented in abundance in the blood. Insulin might restore their metabolic power, and this might conceivably be aided by artificially increasing for a short time the amount of blood-sugar upon which they can commence to feed.

At any rate, experience has suggested that, in the treatment of diabetic coma with insulin, glucose should be given simultaneously, either by mouth or stomach tube or even intravenously. The insulin can generally be administered by hypodermic injection. In cases of extreme circulatory collapse it can be used intravenously without danger. In all cases fluid should at the same time be given, but not much in excess of half a pint every hour, so that the patient on recovery from the coma shall not be in danger of death from pulmonary œdema.

The scanty experience suggests that post-operative coma is difficult to treat. Obviously, the best way is to avoid it by careful preparation before operation—dietetic control and insulin to free the urine of ketones and sugar.

Other complications of diabetes, such as sepsis, tuberculosis, or peripheral neuritis, can presumably be influenced by insulin as favourably as they are by ordinary dietetic control, when the latter succeeds in abolishing glycosuria." (*The Medical Review—May 1923*).

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**"The Treatment of Severe Diabetes with Insulin.**

BY NELLIS B. FOSTER, M.D., NEW YORK.

To begin by estimating the number of calories which a patien needs to maintain weight and energy and then to compute a balanced

diet which will furnish this amount of energy, may seem a fantastic method of treating diabetes. However, this is precisely what is being done to-day in the clinics where iletin is being used. Up to a year ago it was necessary in all severe cases of diabetes to reduce body weight and energy in order that a diet, too meagre to support life in a bulk of tissue, might do so in a smaller mass. In other words, it was necessary to reduce the individual to meet his scanty food supply and of course this resulted in invalidism and mere vegetative existence, terminating either in coma or death from inanition.

The specific action of insulin is notable in its effect on the sugar of the blood. After a dose of insulin the blood sugar falls. The amount of decrease is to some degree dependent upon the size of dose of insulin given, but also upon the severity of the diabetes. Individuals react differently in their quantitative response, although the general effect is alike in all.

It becomes necessary then to determine with some precision the appropriate dose for each individual diabetic. An overdose may reduce the blood sugar too much and cause symptoms which are spoken of as insulin shock. This condition arises if the blood sugar falls below about 0·5 per cent. Coma may develop and death occur. These critical symptoms can be combatted successfully by administering promptly small doses of glucose intravenously. Recognizing this possible source of danger and understanding that a dose of ten units of insulin may have much more effect in one individual than in another, it is evident that the initial period of treatmcnt must be conducted with some degree of exactness. In the New York Hospital we have had considerable experience and have had no case of insulin shock, and in other respects the results have been gratifying beyond expectation.

When a diabetic patient is to receive insulin the diet shouid be controlled in order that the amount of sugar entering the blood be uniform from day to day. With a patient on such a diet the first effect notable after insulin treatment is started is the subsidence of the glycosuria. This may be slow, requiring several days if the dose of insulin be small, or it may be rapid. I have seen the sugar disappear from the urine in a case of diabetic coma within twelve hours. The dose then was, of course, large. After the urine is free of sugar the only guide for dosage is the blood-sugar. From the patient's point of view the effect of insulin is surprisingly prompt. Not infrequentiy within a few days there is a sense of renewed strength and energy which cannot be entirely accredited to psychological effect. This effect is quite easily understood since the sugar, which before treatment was lost to the body and excreted in the urine, under the influence of insulin is utilized for energy. In severe diabetes the urinary glucose may represent twenty-five per cent. of the energy of the food taken.

While an estimation of the degree of severity of a case of diabetes is not an esssential preliminary to treatment of any kind, it is, however, often useful, first as a guide to the amount of insulin probably required, and, second, it is a basis for comparison in future observation



of the patient. To meet this need we have used a rapid method of tolerance estimation which we feel has certain definite advantages. Our standard diet is milk. In the first place milk is a safe diet for a diabetic during the first few days of study. Next, it is fairly uniform in composition and is easily measured. We give one litre of milk a day for three days. This diet represents forty-three grams of protein, forty of fat and fifty-one of carbohydrate, according to the analysis of our milk. During the third day of this period the urine is collected as a twenty-four hour specimen. The total glucose and nitrogen are estimated in this specimen. Since a patient may catabolize more protein than the amount taken in his food, we cannot use the food protein as a basis for estimating the sugar derived from protein. It is well known that several diabetics may catabolize their own muscle tissue. For example, during fasting there is a daily excretion of five to ten grams of nitrogen in the urine and this represents from thirty-one to sixty-two grams of protein. The urinary nitrogen tells the actual protein catabolized regardless of its source. Each gram of nitrogen equals 3.6 grams of glucose derivable from protein.

Nitrogen x 6.25=protein.
58% of protein is converted into glucose.
6.25 x .58=3.6.

Let us use a concrete case in which milk was the only food given during the tolerance test. One litre of milk in this instance contained protein, 33 g.; fat, 41 g.; carbohydrate, 51 g. The twenty-four hour urine contained 6.21 g. of nitrogen and 63 g. of glucose. It is at once evident that this patient is excreting more glucose in the urine than there is carbohydrate in the food. What is this tolerance?

(N) 6 21 + 3 6=22.3 g. (glucose from protein).

The available carbohydrate in the diet is the 22.3 g. (from protein) × 51 g. (sugar in milk) =73.3 g.

Tolerence=73.3—63.9 (urinary glucose)=9.4 g.

This computation is made from one of our cases and represents a very severe type of diabetes. It must be evident, too, that no measure of tolerance, i. e., severity, is possible without taking the protein metabolism into consideration.

As I have already said, the determination of the tolerance of the patient is not absolutely essential but it is of great interest for future comparisons. Now, in building up the diet, attention is first given to the amount of protein food because protein is the indispensible food for which no other can be substituted in the body. The ordinary processes of life cause a breaking down of cells and of tissues, and these cells and tissues must be replaced. The peculiar element in all cells is protein. The minimal amount of protein required by an adult is approximately 0.6 gram to the kilo of body weight. It is advisable that there be some margin and on this account a slightly larger amount than 0.6 gram is desirable. We usually estimate that about 0.8 gram of protein to the kilo of body weight is the correct ration.

Suppose then, that the patient weighs one hundred pounds, which is equivalent to forty-six kilos. Thirty-seven to forty grams of

protein would be the first determination. If the patient is to be on insulin treatment, we need not be too economical in the amount of protein allowed.

In the beginning, we may decide on sixty grams of carbohydrate as the initial allowance. The amount of fat to be given can be definitely determined since the complete combustion of fat to carbon dioxide and water is dependent upon the amount of carbohydrate that is burned at the same time. It has been determined in the last two years that one gram of carbohydrate will effect the complete combustion of 1.5 gram of fat. In estimating the carbohydrates we must take into consideration, also, the carbohydrate derivable from the protein. In the calculations given above, 23·2 grams of carbohydrate result from protein disintegration (40 × 58 per cent.) 23.2 + 60 (the carbohydrates in the food) = 83.2, total carbohydrates of food.

Using this figure as a basis for our carbohydrate-fat ratio, the fat of the food should total about 124 grams. This diet will be equivalent to about 1,500 calories. The adult diabetic who would be, in all probability, underweight if he weighed but 100 pounds, would have a metabolism below normal. On the basis of thirty-three calories to the kilo of body weight he would not require more food than this. In other words, the food represented in such a diet formula as protein forty grams, carbohydrates sixty grams, fat 124 grams, would represent a maintenance diet and would be an advantageous one with which to start treatment with insulin.

If the tolerance of such a patient were as low as the case illustrated above, of course there would be a marked glycosuria unless insulin were given, but with the aid of insulin the glycosuria can be easily controlled. To illustrate the considerable increase of calories which may result in a diet by even slight increases in carbohydrates, take the following table:

TABLE A: DIET COMPUTATION.

| *Protein* | *Carbohydrate* | *Fat* | *Calories* |
|---|---|---|---|
| 24 g. | 30 g. | 85 g. | 980 |
| 24 g. | 40 g. | 109 g. | 1128 |

You will notice in this table that the proteins are the same in both diet formulæ, that the carbohydrate is increased by ten grams in second, but on account of the considerable increase of fat made possible by this slight increase in carbohydrate a marked increase of calories results. It is true that in many cases fat can be given in the diet in excess of the ratio of 1.5 grams of fat for each gram of carbohydrate without there developing ketonuria or any evidences of acidosis. This is due to the fact that diabetic patients who are very markedly undernourished have the power of storing fat in exceedingly large amounts. The tissues seem, under some circumstances, to imbibe fat in something the same way that they may imbibe water after periods of water deprivation. Fat that is stored does not enter into the metabolism; that is, it is not burned, and on that account does not act as a precursor of the ketone bodies.

There remains to determine the amount of insulin required to control the glycosuria which will probably develop in severe diabetes



when the patient is placed on a diet like that outlined above. It is impossible to tell in the beginning how much insulin will be required. On this account, one usually begins with rather smaller doses than it is expected will be needed. If the urine is carefully watched during the first two days, *not as twenty-four hour specimens but each separate voiding*, a guide may be had to the effectiveness of the insulin dosage. One may be sure that the amount given is not excessive so long as sugar remains in the urine. The moment, however, that sugar disappears from the urine there is no guide except the blood sugar. In beginning insulin treatment, one might decide on a dosage of five units three times a day, to be given about half an hour before meals. If it were found on observation during subsequent days that considerable amounts of sugar were being excreted in the urine, then the dose of insulin should be gradually raised. On the other hand, if, after twenty-four or forty-eight hours, sugar should disappear from the urine, then the dose of insulin must be promptly diminished, or possibly it may have to be stopped entirely for a period of six to twelve hours, at the end of which, treatment is reinstated on a smaller dosage as sugar again reappears in the urine. Considerable experimentation is required with each case in order to determine just what amount is necessary to care for the diet and not allow more than traces of sugar in the urine and at the same time not be excessive enough to run the risk of producing a fall in blood sugar to a dangerously low level. There is no rule that can be given in determining this dosage since with some cases five units seem to have as much effect in the combustion of carbohydrate as twenty-five units have in another case.

It is notable in what has already been said that the iletin treatment has caused a wide departure from the standards of scientific treatment which prevailed a year or so ago. Under the old treatment, we regarded it as a mistake to have any sugar in the urine. Some authorities went so far as to endeavour to secure normal blood sugar as well as a sugar free urine. It became evident when we began to use insulin that we must abandon the attempt to maintain a normal blood sugar because the latitude between the normal, fasting blood sugar of 100 to 120 milligrams, and the dangerously low blood sugar of 50 milligrams, was so narrow that slight errors in dose or slight changes in the patient's condition might at any time precipitate insulin shock. In fact, that is what did occasionally occur and caused the change in the procedure. As a result of this experience, many of us now feel that with patients on iletin treatment and not under constant observation, the safest condition is to have constantly a trace of sugar in the urine, the ideal being about 0.1 per cent. The reason for this "buffer sugar" is that when this is present we are confident that the blood sugar is something above 160 milligrams (the renal threshold). Certainly, in many cases, it may be considerably above this. Whether this is a desirable state of affairs in itself, is questionable. But we are presented with the dilemma of running the constant danger of having a patient manifest shock or the alternative of countenancing a persistent glycosuria.

Insulin can be given, as I have said, three times a day before meals. The reason for selecting this time is in order that the absorption of the insulin into the blood stream will coincide approximately with the increase of blood sugar produced by the intake of food. In some patients we find that two doses of insulin a day, one before breakfast and one before supper, meet the desired end, and in a few patients we have succeeded in reducing the dose to one single administration, either in the morning or in the evening. It is obviously desirable to make the number of injections as few as possible, not only on account of the convenience to the patient but also because there are relatively few skin surfaces of the body suitable for hypodermic injections and when these are being given two or three times a day, the problem of a suitable site may become serious.

I wish to give two specific cases which illustrate not only the efficacy of insulin in the treatment of severe diabetes but also tell better than any explanation can do the method of its use.

CASE I.—The patient, M. T., had been a severe diabetic for several years. He was a man forty-two years old and had gradually lost tolerance in spite of intelligent and faithful care. At the time he came under our observation he weighed eighty-seven pounds. His tolerance, as estimated according to the procedure outlined, was thirty-three grams. On a diet containing forty grams of protein, forty-five grams fat and fifty grams carbohydrates he excreted forty-two grams of sugar in his urine.

CHART I.

| | Diet | | | Units | | Urine | | Blood | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Jan. | C | P | F | Cal. | Iletin | G | K | G | $CO_2$ | |
| | | | | | | Gram | | Mg. | | |
| 1. | 50 | 40 | 45 | 760 | 0 | 43 | + | 272 | 48 | Ur. N=7.2×36.5=26 |
| | | | | | | | | | | 26+50=76—43=33 |
| | | | | | | | | | | T=33 |
| 8. | 20 | 40 | 100 | 1140 | 9 | 8.7 | 0 | | | |
| 9. | 20 | 40 | 100 | 1140 | 9 | 8.5 | 0 | 185 | 54 | |
| 11. | 20 | 40 | 100 | 1140 | 9 | 0 | 0 | | | |
| 15. | 40 | 50 | 120 | 1440 | 15 | 0 | 0 | | | |
| 16. | 40 | 50 | 120 | 1440 | 15 | 0 | 0 | 160 | | |
| 17. | 40 | 50 | 120 | 1440 | 15 | 0 | 0 | | | |
| 19 | 40 | 50 | 120 | 1440 | 15 | 0 | 0 | | | |
| 20. | 60 | 50 | 130 | 1610 | 15 | 0 | 0 | | | |
| 21. | 60 | 50 | 130 | 1610 | 15 | 0 | 0 | | | |
| 22. | 70 | 50 | 140 | 1740 | 15 | 0 | 0 | | | |

It will be noticed from Chart I that the patient's initial diet contained twenty grams of carbohydrate, and one hundred grams of fat, and on this diet his urine became sugar free on the third day with the aid of nine units of iletin in a day. The diet was then raised from 1,140 calories to 1440 and the iletin to fifteen units a day. Five days later the diet could again be raised to 1,600 calories and again three days later to 1,700. In the meantime the blood sugar G, had been reduced practically to normal. The subsequent history of this patient is that since he left the hospital he has continued to improve



and his weight is now 122 pounds. His strength and sense of well-being have increased even more than his weight might signify.

We have a number of patients of this type who, under ordinary circumstances, would not be able to carry on any occupation, but who are, with the aid of iletin, pursuing light occupations and making their living. It is not difficult to teach any patient to administer iletin to himself.

I have never seen a recovery from diabetic coma treated by the older methods. I have once or twice seen the patient brought back to consciousness for a matter of hours. Therefore, to me, recovery from diabetic coma to such an extent that the patient left the hospital in some semblance of health is indeed a dramatic incident.

CHART II.

| | Diet | | | Units | | Urine | | Blood | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Oct, | C | P | F | Cal. | Iletin | G | K | G | $CO_2$ | |
| | | | | | | Gram | | Mg. | | |
| 3 | .... | | | | 70 | ++ | +++ | 330 | 9.7 | in coma |
| 4. | ....50 | 43 | 50 | 700 | 100 | ++ | +++ | 260 | | conscious |
| 5. | ....50 | 43 | 50 | 700 | 70 | 25 | ++ | 288 | 37 | |
| 6. | ....50 | 43 | 50 | 700 | 40 | 19 | ++ | 304 | 40 | |
| 7. | ....50 | 43 | 50 | 700 | 100 | 61 | ++ | 248 | 44 | |
| 8. | ....50 | 43 | 50 | 700 | 80 | 44 | + | | | |
| 9. | ....50 | 43 | 50 | 700 | 60 | 7 | + | | | |
| 10. | ....30 | 40 | 60 | 820 | 60 | 4.4 | 0 | | | |
| 11. | ....30 | 40 | 60 | 820 | 60 | 0 | 0 | 150 | 55 | |

Chart II is the record of one of our cases of diabetic coma in which the patient recovered. He was brought to the hospital in deep coma and the severity of the acidosis was notable in the carbon dioxide combining power of the blood, 9.7. In just one week the urine was free of sugar and the blood sugar had been reduced to what might be called a fairly normal level with all evidences of acidosis gone. The diet in this case was subsequently raised considerably and the patient accordingly gained weight and strength and left the hospital in splendid condition.

We have had seven cases of recovery from diabetic coma.

Another field in which insulin has proved of greatest help is in the treatment of diabetes with surgical complications. One of the commonest instances that come to my observation is severe infection requiring surgical treatment in diabetic subjects. These cases present a serious surgical hazard. The mortality under the older methods was over seventy-five per cent. From the history, it may be judged in many cases that the diabetic state has been of long duration and is not severe. These patients are often stout, sometimes even obese. When an infection occurs there is at once a marked increase in the severity of the diabetes as a consequence of the infection. The fever becomes an added factor in speeding up metabolism. The result is a serious infection in a severe diabetic. The mortality in these cases has always been high. If the patients are not operated upon they are sure to die. If they are operated upon they probably will die. Ether increases the hyperglycemia, and likewise the acidosis. Several cases of this kind that we have had the opportunity to treat

with insulin resulted so satisfactorily that I think it issa fe to say that could one start with insulin be ore operation one could be reasonably sure that the patient would not die of diabetes. An astonishing fact concerning some of these cases is that when the infection has subsided, the diabetes not infrequently turns out to be quite mild and the patient does not any longer need insulin treatment, but can be maintained quite comfortably by the older methods.

It may well be asked what necessity is there of any restriction in diet if insulin is used in large amounts. The answer to that, it seems to me, is found in the fact that insulin cannot be used in large amounts unless the patient is constantly under observation or has been under observation a sufficient length of time to determine, with some exactness, the relation of the high dosage to a definite diet. Now, if this diet is transgressed, symptoms develop analogous to those in diabetics who have had no treatment, namely, thirst, polyuria, etc.

Then, too, when the insulin dosage is high the carbohydrate dosage, too, must be constant or there will in all probability be accident. All observers have noted that a fairly constant and definite ratio between total carbohydrate in the diet and the number of units of insulin used seems to exist for each patient.

This ratio is individual and varies in different cases but for successful treatment it must first be determined, then adhered to, and occasionally corrected."—*New York, Medical Journal and Medical Record.*

## CORRESPONDENCE.

To

THE EDITOR.

THE "MADRAS MEDICAL JOURNAL,"

*Madras.*

SIR,

May I request you to kindly publish in the columns of your valuable journal, "The Madras Medical Journal," the accompanying notice for a prize essay.

A PRIZE ESSAY

ON

"VILLAGE SANITATION IN MALABAR."

An honorarium of Rs. 50 will be given to the best paper on "Village Sanitation in Malabar." Qualified medical men who have an idea of the rural parts of Malabar are invited to send in practical suggestions for the improvement of the sanitary condition of the district. Practical methods of cheap and efficient disposal of night-soil and avoidance of water and soil pollution, which the rich and the poor can adopt, should merit special attention.

The essays must be as brief as possible, written legibly only on one side of the paper, and sent to the following address on or before 31st October 1923.

Dr. M. L. Kamath, B.A., M D., Acting District Surgeon, Malabar, and Rao Bahadur Dr. G. V. James, M.D., Civil Surgeon, Tellicherry, have consented to act as Judges.

V. KRISHNA MENON,
*Medical Practitioner,*
*Chowghat, S. Malabar.*



## SERVICE NOTES.

1*st May* 1923.

M.R.Ry. Rama Kamath Avargal, M.B., C.M., leave on average pay for a fortnight from date of relief.

M.R.Ry. Rao Bahadur Gnanamuthu Vedamanickam James Avargal, M.D., C.M., leave on average pay for three months from date of relief.

Mr. Evers, M.D., D.P.H., leave on average pay for eight months and in continuation leave on half average pay for one year and eleven days with effect from the 1st September 1923 preparatory to retirement.

Dr. K. T. Matthew, D.HY., D.P.H. (Cantab), Assistant Director of Public Health, leave on average pay for two months from date of relief.

Rao Bahadur Dr. Kesava Pai, M.D., leave for one year consisting of leave on average pay in India for four months, leave on average pay out of India for four months and study leave for four months, with effect from the date of relief.

In modification of notification No. 251, published on page 131 of Part I-A of the *Fort St. Gebrge Gazette*, dated 13th March 1923, M.R.Ry. Yoppur Sitapati Ayyar Avargal, E.M.S., study leave for twelve months, with effect from 20th April 1923 or date of relief.

M.R.Ry. Sitaramaswami Nayudu Garu, L.M.S., extension of leave on average pay up to and inclusive of 30th April 1923.

The services of Major A. S. Leslie, M.D., I.M.S., are placed at the disposal of the Government of Madras, with effect from the forenoon of the 7th March 1923.

Mr. G.J. Pacheco, L.M.S., Civil Assistant Surgeon, Assistant to the District Medical and Sanitary Officer, Guntur, is transferred to the Government Headquarter Hospital, Ootacamund (Nilgiris, The), *vice* Mr. C. T. Verghese, L.M.S., Civil Assistant Surgeon.

M.R.Ry. A. Krishnamurthi Avargal, B.A., M.B.C.M., Civil Assistant Surgeon attached to the Local Fund Hospital, Amalapuram, Godavari district, is granted leave on average pay for twenty-two days from 9th March to 30th March 1923 under the Fundamental Rules.

M.R.Ry. T. S. Somasundara Ayyar Avargal, L.M.S., on return from leave, to be Assistant to District Medical and Sanitary Officer, Bellary, *vice* M.R.Ry. T. S. Ramakrishna Ayyar Avargal.

M.R.Ry. T. S. Ramakrishna Ayyar Avargal, L.M.S., on relief at Bellary, placed at the disposal of the President District Board, Tinnevelly, *vice* M.R.Ry. K. Gopala Menon Avargal.

M.R.Ry. K. Gopala Menon Avargal, L.M.S., on return from leave, placed at the disposal of the Chairman, Municipal Council Mayavaram (Tanjore district), *vice* M.R.Ry. C. Rangabashyam Nayudu Garu.

M.R.Ry. C. Rangabashyam Nayudu Garu, M.B., C.M., on relief at Municipal Hospital, Mayavaram, to be Assistant to District Medical and Sanitary Officer, Godavari, *vice* M.R.Ry. G. S. Sankara Ayyar Avargal.

M.R.Ry. G. S. Sankara Ayyar Avargal, L.M.S., on relief at Cocanada, placed at the disposal of the Cahirman, Municipal Council, Gudiyattam (North Arcot District), *vice* M.R.Ry. K. S. Subrahmanyam Avargal, transferred.

8*th May* 1923.

*Leave*—Major Bradfield, O.B.E., I.M.S., one month's leave on average pay from the 21st April 1923 or date of relief.

*Appointments.*—Mr. Williams, B.A., M.B., C.M., etc., on return from leave, to resume his acting appointment as Civil Surgeon, Tuticorin, Port Health Officer and Medical Inspector of Emigrants, Tuticorin.

M.R.Ry. Rama Kamath Avargal, M.B., C.M., to act as Civil Surgeon, Tellicherry, during the absence of Dr. G. V. James, M.D., on leave and then to act as Civil Surgeon, Negapatam, in relief of M.R.Ry. B. Iswarayya Avargal, M.B., C.M., proceeding on leave.

Mr. Heusman, M.B.C.S., L.R.C.P., L.M.S., to act as District Medical and Sanitary Officer, Anantapur, *vice* M.R.Ry. K. Balasimha Rao Avargal, with effet from the date of taking charge.

Captain Verdon, I.M.S., on joining the Civil Department, to be attached to the Governemnt Ophthalmic Hospital, Madras, from the 4th to the 26th April 1923 (inclusive) and then to act as Professor of Ophtholmology, Medical College, and Superintendent, Government Ophthalmic Hospital, Madras, during the absence of Major R. E. Waight, I.M.S., on leave.

M.R.Ry. Rao Bahadur T. M. K. Nedungadi Avargal, L.M.S., to be District Medical and Sanitary Officer, Ganjam, and Superintendent, District Jail, Berhampur, without prejudice to his officiating appointment as Personal Assistant to the Surgeon-General, with effect from the 24th January 1923, *vice* Dr. T. R. Lakshmanaperumal Pillai (deceased).

M.R.Ry. P. F. Mathias Avargal, B.A., M.B.C.M., to be Civil Surgeon, Tellicherry, without prejudice to his officiating appointment as District Medical and Sanitary Officer, Bellary, with effect from the 9th March 1923, *vice* Dr. H. S. Halge, retired.

The Government are pleased to appoint Miss M. Stewart, M.B., W.M.S.I., as Assistant Superintendent, Medical School for Women, Madras, with effect from the 1st April 1923.

Major W. C. Paton, M.M.B., F.R.C.S.E., I.M.S., to do duty in the Government General Hospital, Madras, temporarily with effect from the 8th April 1923 and thereafter to act as Resident Medical Officer, Government General Hospital, and Medical Officer to His Excellency the Governor's Bodyguard Dispensary, Madras, with effect from the date of taking charge.

*No.* 395.—Major A. P. G. Lorimer, M.B., I.M.S., to act as Second Surgeon, Government General Hospital, Madras, with Port and Marine duties, and Professor of Medical Jurisprudence, Medical College, Madras, wiht effect from date of taking charge.

M.R.Ry. Sitaramaswami Nayudu Garu, L.M.S., to act as District Medical Officer, Godavari, with effect from the date of taking charge.

Lieutenant-Colonel Shaik Abdur Razzak, M.R.C.S., L.R.C.P., I.M.S., to act as District Medical Officer, Tanjore, Medical Officer, Borstal Institution, and Superintendent, Medical School, Tanjore, with effect from the date of taking charge.

Major S. M. Hepworth, M.B., I.M.S., to act as Distirct Medical Officer and Medical Officer, Central Jail, Salem, with effect from the date of taking charge.

The Government are pleased to direct that, on the appointment of a District Health Officer on each district, the designation of the District Medical and Sanitary Officer for that district be changed to 'District Medical Officer.'

M.R.Ry. C. N. Venkoba Roa, L.M.S., is appointed as District Health Officer Anantapur, with effect from 1st April 1923.

Under section 69 (1) of Madras Local Boards Act, 1920, the President, District Board, Chittoor, is pleased to appoint M.R.Ry. S. Koppala Pillai Avargal, L.M.S., as District Health Officer, Chittoor, with effect from 1st April 1923.

M.R.Ry. K. C. Kutti Ettan Raja Avargal, L.M.S., is appointed District Health Officer, Coimbatore, with effect from the 1st April 1923, under section 69 (1) of the Madras Local Boards Act, 1920.

Mr. T. C. Joseph, L.M.S., whose services are placed at the disposal of the President, District Board, Nellore, under G.O. No. 535-P.H., dated 27th March 1923, is appointed to be District Health Officer, Nellore.

Under section 69 (1) of the Madras Local Boards Act, 1920, the President District Board, Ramnad is pleased to appoint Mr. K. P. Thomas, L.M.S., as District Health Officer, Ramnad, with effect from 1st April 1923.



*Leave.*—M.R.Ry. G. Srinivasamurti Avargal, B.A., B.L., M.B., C.M., Civil Assistant Surgeon and Secretary to the Committee on the Indigenous System of Medicine, Madras, is granted leave on average pay for four months from 1st April 1923 under the Fundamental Rules.

*Extension of Service.*—Under subsidiary rule to rule 56 (*a*) of the Fundamental Rules, the Surgeon-General is pleased to grant M.R.Ry. Rao Sahib Ayathan Gopalan Avargal (Civil Assistant Surgeon), Deputy Superintendent, Government Lunatic Asylum, Calicut, further extension of service for one year from 16th May 1923.

*Postings and Transfers.*—(1) M.R.Ry. C. A. Sivaraman Avargal, L.M.S., Civil Assistant Surgeon, on return from leave, to be Assistant to District Medical and Sanitary Officer, Chittoor, *vice* M.R.Ry. N. Subrahmanya Ayyar Avargal, L.M.S., Temporary Civil Assistant Surgeon, transferred.

(2) M.R.Ry. N. Subrahmanya Ayyar Avargal, L.M.S., Temporary Civil Assistant Surgeon, on relief at Chittoor, to the Governement Royapetta Hospital, Madras, *vice* M.R.Ry. A. R. Parasurama Mudaliyar Avargal, L.M.S., Civil Assistant Surgeon, transferred.

(3) M.R.Ry. A. R. Parasurama Mudaliyar Avargal, L.M.S., Civil Assistant Surgeon, on relief at the Government Royapetta Hospital, Madras, to the Government Tuberculosis Hospital, Madras, *vice* Mr. W. C. Thomas, L.M.S., Civil Assistant Surgeon, transferred.

(4) Mr. W. C. Thomas, L.M.S., Civil Assistant Surgeon, on relief at the Government Tuberculosis Hospital, Madras, to be Assistant to the District Medical and Sanitary Officer, Guntur, *vice* Mr. G. J. Pacheco, L.M.S., transferred.

*Appointment.*—Mr. N. B. Morris, L.M.S., L.R.C.S., L.R.C.P., Civil Assistant Surgeon, on relief at the Medical College, Madras, is appointed to be Assistant to the District Medical and Sanitary Officer, Bellary, *vice* M.R.Ry. T. S. Ramakrishna Ayyar Avargal, L.M.S., Civil Assistant Surgeon, transferred.

*15th May 1923.*

M.R.Ry. K. Balasimha Rao Avargal, B.A., M.B., C.M., is granted leave on average pay for six months with effect from the 29th March 1923 afternoon.

Major W. R. D'Sylva, I.M.D., leave on medical certificate for eight months with effect from the 22nd November 1922, of which four months and six days will be leave on average pay under the Civil Leave Rules and three months and twenty-four days leave under the Military Leave Rules.

*Appointments.*—M.R.Ry. S. Kumaraswami Pillai Avargal, L.M.S., to act as District Medical Officer, North Arcot, with effect from the 9th April 1923 afternoon, as a temporary measure, and thereafter to act as District Medical Officer, Nellore, from the date of taking charge.

M.R.Ry. W. V. Perumal Avargal, L.M.S., is appointed as District Health Officer, Chingleput district, with effect from 1st April 1923.

Under the powers vested under section 69 (1) of the Local Boards Act, 1920, the President, District Board, Godavari, is pleased to appoint Mr. A. V. Kamath as the District Health Officer, Godavari district, as the Government are pleased to place his services under the disposal of the President, District Board, Godavari, in G.O. No. 535, P.H., dated 27th March 1923.

*Leave.*—First-class Military Assistant Surgeon J. A. Hart, I.M.D., Deputy Superintendent, Government Lunatic Asylum, Madras, is granted leave on average pay from 15th May to 30th June 1923 (both days inclusive) under rule 100 of the Fundamental Rules.

*Posting.*—Mr. C. Oommen, M.B., B.S., Temporary Civil Assistant Surgeon, on relief at the Government General Hospital as Assistant to Resident Medical Officer, to act as Assistant to the Professor of Surgery, Medical College, Madras, *vice* Mr. N. B. Morris, L.M. & S., L.R.C.S., etc., Civil Assistant Surgeon, transferred.

*Leave.*—Miss A. B. Hardy, M.B., B.S., Lady Assistant Surgeon, attached to Government Head-quarter Hospital, Trichinopoly, is granted leave on average pay for three weeks from 1st May 1923 or date of relief under the Fundamental Rules.

*Extension of Leave.*—M.R.Ry. K. Gopal Rao Avargal, L.M.S., Civil Assistant Surgeon, attached to Local Fund Hospital, Parvatipuram, Vizagapatam district, is granted extension of leave on average pay for one month in continuation of leave on average pay for three months already granted under the Fundamental Rules.

*Leave.*—First-class Military Assistant Surgeon C. G. Taylor, I.M.D., attached to Government Ophthalmic Hospital, Madras, is granted leave on average pay for one month from 1st June 1923 under rule 100 of the Fundamental Rules.

*Posting.*—Mr. P. C. Cheriyan, L.M.S., Civil Assistant Surgeon, on return from leave, to be Assistant to District Medical and Sanitary Officer, Salem, *vice* Mr. K. I. John, L.M.S., Civil Assistant Surgeon, transferred.

*Services placed.*—Mr. K. I. John, L.M.S., Civil Assistant Surgeon, on relief at Salem, is replaced at the disposal of the President, District Board, Salem, for Local Fund Hospital, Hosur.

*22nd May 1923.*

*Leave.*—Major R. E. Wright, I.M.S., study leave for one month in lieu of leave on half average pay already granted for the same period.

M.R.Ry. B. Iswarayya Avargal, M.B., C.M., leave on average pay for six months with effect from the date of relief.

Mr. L. W. Pereira, L.M.S., leave on average pay for one month with effect from the 10th May 1923.

*Appointments.*—During the absence of Mr. L. W. Pereira on leave, M.R.Ry. R. Subbayya Avargal, M.B., B.S., Assistant to the District Medical Officer, South Arcot, will act as District Medical Officer, South Arcot, in addition to his duties.

Captain F. J. Anderson, I.M.S., to do duty in the Government General Hospital, Madras, as a temporary measure from the 7th May 1923.

Under section 69 (1) of the Madras Local Boards Act, 1920, M.R.Ry. B. Subraya Baliga Avargal, L.M.S., is appointed to be District Health Officer, Bellary, with effect from 1st April 1923.

Under section 69 (1) of the Madras Local Boards Act, 1920, and under the authority of G.O. No. 535, P.H., dated 27th March 1923, the President, District Board, Tinnevelly, notifies the appointment of M.R.Ry. M. Govinda Pillai Avargal, M.B., B.S., B.SC., as District Health Officer, Tinnevelly, with effect from 1st April 1923.

*Leave.*—M.R.Ry. K. Gopala Menon Avargal, L.M.S., Civil Assistant Surgeon attached to Local Fund Hospital, Srivaikuntam, Tinnevelly district, is granted leave on average pay for twenty-nine days and leave on half average pay for one month and one day from 20th March 1921 under the Fundamental Rules.

*Posting.*—Mr. C. K. Joseph, M.B., C.M., Civil Assistant Surgeon, on return from leave, is posted to the Government Head-quarter Hospital, Cuddalore (South Arcot), on reserve duty until further orders.

*Leave.*—M.R.Ry. B. Madhava Achar Avargal, L.M.S., Civil Assistant Surgeon, attached to Municipal Hospital, Tenali, Guntur district, leave on average pay for fifteen days from 1st May 1923 afternoon under Fundamental Rule 81 (*b*).

*Services placed.*—In supersession of this office order R. No. 905-E, dated 17th April 1923, M.R.Ry. J. Dhairyam Avargal, L.M.S., temporary Civil Assistant Surgeon, on relief from Fituri duty, Agency division, is placed at the disposal of the President, District Board, Vizagapatam, *vice* M.R.Ry. D. Hari Rao Garu, M.B., B.S., Temporary Civil Assistant Surgeon, transferred.

*Posting.*—M.R.Ry. K. Kannan Nambiyar Avargal, B.A., L.M.S., on demobilization, is re-entertained as a Temporary Civil Assistant Surgeon and posted to the Government Maternity Hospital, Madras, on reserve duty for a period not exceeding one month.

*29th May 1923.*

*Appointments.*—Major A. P. G. Lorimer, I.M.S., to act as Professor of Surgery, Medical College and First Surgeon, General Hospital, Madras, in addition to his duties until the return of Lieut.-Colonel E. W. C. Bradfield, I.M.S., from leave.



Lieut.-Colonel F. F. Elwes, C.I.E., I.M.S., to act as Superintendent, General Hospital, Madras, in relief of Lieut.-Colonel T. H. Symons, O.B.E., I.M.S., and until the return of Lieut.-Colonel E. W. C. Bradfield, I.M.S., from leave.

Lieut.-Colonel E. W. C. Bradfield, O.B.E., I.M.S., on return from leave, to act as Professor of Surgery, Medical College, Madras, and First Surgeon, General Hospital, Madras. He will also act as Superintendent, General Hospital, Madras, until relief by Lieut.-Colonel R. B. B. Foster, I.M.S.

Lieut.-Colonel R. B. B. Foster, I.M.S., to act as Superintendent and Second Surgeon, General Hospital, Madras, with Port and Marine duties, with effect from the 1st July 1923.

Lieut.-Colonel Diwan Ganpat Rai, I.M.S., to act as Surgeon, Fourth district, and Superintendent, Royapetta Hospital, Madras, with effect from the 1st July 1923.

Lieut.-Col. T. H. Symons, O.B.E., I.M.S., to officiate as Surgeon-General with the Government of Madras, *vice* Major-General Sir Gerald Giffard, K.C.I.E., C.S.I., K.H.S., I.M.S., who has been granted leave preparatory to retirement.

M.R.Ry. M. S. Lakshmanan Avargal is appointed District Health Officer, Cuddapah, with effect from 1st April 1923.

Under section 69 of the Local Boards Act, 1920, Sriman B. Misra Mahasayo, M.B., B.S., has been appointed as District Health Officer, Ganjam, with effect from 1st April 1923.

*Leave.*—Second-class Military Assistant Surgeon H. M. Lafrenais, I.M.D., Assistant to Director, Pasteur Institute of Southern India, Coonoor, is granted leave on average pay for one month from 3rd May 1923 or date of relief under rule 100 of the Fundamental Rules.

*Extension of Leave.*—V. Venugopala Nayudu Garu, B.A., M.B., C.M., Civil Assistant Surgeon, is granted extension of furlough for seven months and seventeen days on medical certificate from 1st March 1923, under article 371 (*a*) of the Simplified Leave Rules embodied in G.O. No. 847, Finance, dated the 22nd September 1920.

*Posting.*—Miss A. B. Hardy, M.B., B.S., Lady Assistant Surgeon, Headquarter Hospital, Trichinopoly, is posted to the Medical School for Women, Madras, to fill a sanctioned appointment with effect from 1st July 1923.

*Leave.*—M.R.Ry. N. Seshadri Nathan Avargal, L.M.S., Temporary Civil Assistant Surgeon, attached to King Institute, Guindy, is granted leave on average pay from 14th March to 28th March 1923 (both days inclusive) under the Fundamental Rules with permission to avail himself of the Easter holidays from 29th March to 31st March 1923.

*Transfers.*—M.R.Ry. A. Srinivasalu Nayudu Garu, B.A., L.M.S. from reserve duty in the Government General Hospital, Madras, to be Assistant to the Professor of Hygiene and Bacteriology, Medical College Madras, *vice* M.R.Ry. Shankar Rao Pandit Avargal, B.A., M.B., B.S., B.S.SC.

M.R.Ry. Shankar Rao Pandit Avargal, B.A., M.B., B.S., B.S.SC., Temporary Civil Assistant Surgeon, on relief at the Medical College, Madras, to King Institute of Preventive Medicine, Guindy, to fill a vacancy caused by the grant of leave for one year to Rao Bahadur Dr. M. Kesava Pai, B.A., M.D., C.M.

*5th June 1923.*

*Leave.*—Major W. C. Gray, I.M.S., leave on average pay for five weeks with effect from the 28th May 1923 or date of relief.

*Permitted to return.*—Major G. E. Malcomson, I.M.S., has been permitted to return to duty.

*Appointments.*—Major-General Sir G. G. Giffard, K.C.I.E., C.S.I., K.H.S., I.M.S., having resigned his seat upon the Madras Medical Council, the Government are pleased, in virtue of the powers vested in them under sub-section (1) (*a*) of section 5 of the Madras Medical Registration Act, 1914 (Act IV of 1914), to appoint Lieut.-Col. T. H. Symons, B.E., I.M.S., to be the President of the Madras Medical Council.

During the period of Major W. C. Gray's absence on leave, Major F. J. St. P. Dunn, I.M.D., will act as Surgeon, First District, Superintendent, Royapuram Hospital, and Medical Inspector of Emigrants, in addition to his duties, and M.R.Ry. V. P. Kamath Avargal, L.M.S., will act as Superintendent, Royapuram Medical School, in addition to his duties.

Mr. A. J. George, L.M.S., whose services are placed at the disposal of the President. District Board, Kurnool, under G.O. No. 535, P.H., dated 27th March 1923, is appointed to be District Health Officer, Kurnool.

Mr. T. C. John, L.M.S., is appointed District Health Officer, Malabar, with effect from 1st April 1923.

Under section 69 of the Madras Local Boards Act, 1920, M.R.Ry. R. Kanagasabapathi Pillai Avargal, M.B., B.S., B.S.SC., has been appointed District Health Officer, North Arcot, with effect from the 12th April 1923.

*Leave.*—M.R.Ry. D. Dayananda Rao Avargal, L.M.S., Civil Assistant Surgeon, is granted leave on average pay for the periods noted below under proviso to rule 81 (*b*) (ii) of the Fundamental Rules:—One month from 17th February 1923 afternoon. Fifteen days from 29th March 1923 forenoon.

*Transfer.*—Mr. G. I. Benjamin, on the expiry of leave granted by the Military Department, is re-entertained in this department as a Temporary Civil Assistant Surgeon and posted to the Government General Hospital, Madras, *vice* Mr. C. Oommen, M.B., B.S., Temporary Civil Assistant Surgeon, transferred to the Medical College, Madras.

*Leave.*—M.R.Ry. B. Tirumal Rao Pantulu Garu, L.M.S., Civil Assistant Surgeon, attached to Local Fund Hospital, Narasapur, Kistna district, is granted leave on average pay for one month and ten days from 31st March 1923 under rule 81 of the Fundamental Rules.

*Transfer.*—Saiyed Ghulam Hussain Sahib Bahadur, L.M.S., Civil Assistant Surgeon, on relief at the office of the Surgeon, Third District, Madras, is placed at the disposal of the President, District Board, Ganjam, for the charge of Local Fund Hospital, Chatrapur, *vice* M.R.Ry. D. Narayana Rao Garu, M.B., B.S., transferred to Chicacole.

M.R.Ry. E. A. Varada Ayyar Avargal, L.M.S., Civil Assistant Surgeon, on relief in the office of the Surgeon, Second District, Madras, is posted to the Government Royapetta Hospital, Royapetta, to fill the additional Civil Assistant Surgeon's post sanctioned in G.O. Mis. No. 838, P.H., dated 25th May 1923.

*Extension of Leave.*—M.R.Ry. T. S. Somasundaram Ayyar Avargal, L.M.S., Civil Assistant Surgeon, is granted leave on average pay for four months under rule 81 of the Fundamental Rules in continuation of leave on average pay for four months already granted from 23rd December 1922 afternoon.

*Posting.*—M.R.Ry. D. Raghava Rao Garu, L.M.S., Temporary Civil Assistant Surgeon at the Lunatic Asylum, Madras, is appointed to act as Deputy Superintendent of the Lunatic Asylum, Madras, in addition to his own duties, *vice* First-class Military Assistant Surgeon Mr. J. A. Hart, I.M.D., granted leave.

*12th June 1923.*

*Leave.*—Lieut.-Col. J. W. Cornwall, I.M.S., leave on average pay for eight months with effect from the 2nd July 1923.

Major J. M. Skinner, I.M.S., leave on average pay for twenty-five days with effect from the 1st May 1923.

*Appointments.*—Captain V. Mahadevan, F.R.C.S.E., I.M.S., to act as District Medical Officer, North Arcot, with effect from the date of taking charge.

During the absence of Major J. M Skinner, I.M.S., on leave, Major William Leonard Forsyth, I.M.S., will act as Surgeon, Third District, Second Physician, Government General Hospital and Professor of Physiology, Medical College, Madras, in addition to his duties.

*Transfer.*—In partial modification of this office order R. No. 1304-H, dated 25th May 1923, M.R.Ry. Shankar Rao Pandit Avargal, B.A., M.B., B.S., B.S.SC., Temporary Civil Assistant Surgeon, on relief at the Medical College, Madras, is transferred to the King Institute, Guindy, on reserve duty for a period not exceeding one month from 4th June 1923 and then appointed to fill the vacancy caused by the grant of leave for one year to Rao Bahadur Dr. M. Kesava Pai, B.A., M.D., C.M.



*Leave.*—Miss F. Hesterlow, Lady Assistant Surgeon, Government Pentland Hospital, Vellore, is granted leave on average pay for five weeks with effect from 11th May 1923.

*Leave.*—M.R.Ry. V. Viswanatha Sarma Avargal, L.M.S., Civil Assistant Surgeon attached to Local Fund Hospital, Shiyali, Tanjore district, is granted leave on average pay for six weeks from 1st June 1923, or date of relief, under the Fundamental Rules.

M.R.Ry. G. Bhavani Shanker Avargal. Civil Assistant Surgeon, attached to Government Maternity Hospital, Madras, is granted leave on average pay for one month and fifteen days and leave on half average pay for two months and fifteen days in continuation thereof. from the date of relief.

*Appointment.*—Miss E. King, M.B., B.S., is re-entertained in the department as a Temporary Lady Assistant Surgeon and posted to Head-quarter Hospital, Trichinopoly, *vice* Lady Assistant Surgeon Miss A. B. Hardy, M.B., B.S.

*Extension of Leave.*—M.R.Ry. K. Gopal Rao Avargal, L.M.S., Civil Assistant Surgeon, attached to Local Fund Hospital, Parvathipuram, Vizagapatam district, is granted further extension of leave on average pay for fifteen days, from 12th May 1923, under the Fundamental Rules.

*19th June 1923.*

Under section 69 (1) of the Madras Local Boards Act. 1920, M.R.Ry. B. G. Prabhu Avargal, L.M.S., has been appointed District Health Officer, South Kanara, with effect from 1st April 1923.

*Services placed.*—M.R.Ry. S. K. Hattiangady Avargal, L.M.S., Civil Assistant Surgeon, on relief at the Local Fund Hospital, Manantoddy (Malabar district), is placed at the disposal of the President, District Board, South Kanara, *vice* M.R.Ry. K. M. Ananthan Avargal, M.B., B.S., Civil Assistant Surgeon, transferred.

*Posting.*—With reference to G.O. No. 674, P.H., dated 19th April 1923, M.R.Ry. K Kannan Nambiyar Avargal, L.M.S., Temporary Civil Assistant Surgeon on reserve duty at Government Maternity Hospital, Madras, is posted to the Government Ophthalmic Hospital, Madras, for training for three months from 15th June 1923.

*Postings and Transfers.*—M.R.Ry. B. V. Narasimhayya Garu, L.M.S., Civil Assistant Surgeon, on relief at Berhampur, to Medical School, Vizagapatam, *vice* M.R.Ry. D. Hari Rao Garu, M.B., B.S., Temporary Civil Assistant Surgeon.

M.R.Ry. D. Hari Rao Garu, M.B., B.S., Temporary Civil Assistant Surgeon, on relief at Medical School, Vizagapatam, to act as Assistant to the District Medical and Sanitary Officer, Agency division, Vizagapatam, *vice* Mr. P. K. Koshy, B.A., M.B., B.S., Civil Assistant Surgeon proposed to be transferred to the Medical College, Madras.

M.R.Ry. K. Srinivasa Sastri Avargal, L.M.S., Temporary Civil Assistant Surgeon, on relief at Kurnool by M.R.Ry. B. Sankara Rao Avargal, L.M.S., Civil Assistant Surgeon, to Local Fund Police and Sub-jail hospitals, Koraput (Agency division), *vice* Mr. P. J. McGrath, I.M.D., first-class Military Assistant Surgeon applied for leave.

M.R.Ry. G. Sankaran Tambi Avargal, B.A., M.B., B.S., on the expiry of leave granted by Military Department, re-entertained as a Temporary Civil Assistant Surgeon in the department, is placed at the disposal of the Chairman, Municipal Council, Palni. Madura district, *vice* M.R.Ry. K. V. Muthayya Pillai Avargal, L.M.S., Temporary Civil Assistant Surgeon.

M.R Ry. K. V. Muthayya Pillai Avargal, L.M.S., Temporary Civil Assistant Surgeon, on relief at the Municipal Hospital, Palni, is placed at the disposal of the President, District Board, South Arcot, for Local Fund Hospital, Kallakurchi, *vice* M.R.Ry. V. H. Venkataraman Avargal, B.A., M.B., B.S., Civil Assistant Surgeon, proposed to be transferred to the new Medical College, Vizagapatam.

*Transfers.*—M.R.Ry. U. Venkataraya Nayak Avargal, M.B., B.S., Temporary Civil Assistant Surgeon, on relief at the Medical School, Tanjore, to the Medical School, Vizagapatam, *vice* M.R.Ry. R. Krishna Rao Avargal, L.M.S.

M.R.Ry. R. Krishna Rao Avargal, L.M.S., Civil Assistant Surgeon, on relief at the Medical School, Vizagapatam, to the Medical School, Tanjore, *vice* M.R.Ry. U. Venkataraya Nayak Avargal, M.B., B.S., transferred.

*Leave.*—M.R.Ry. C. N. Anantaranga Rao Avargal, L.M.S., Civil Assistant Surgeon, Local Fund Hospital, Bobbili, Vizagapatam district, is granted leave on average pay for two months from 15th July 1923 or date of relief under Fundamental Rules.

*Postings and Transfers.*—M.R.Ry. K. R. Sitarama Ayyangar Avargal, B.A., L.M.S., Civil Assistant Surgeon, on return from leave, to be Assistant to District Medical Officer, Coimbatore, *vice* Mr. C. H. Philip, M.B., C.M., Civil Assistant Surgeon.

Mr. C. H. Philip, M.B., C.M., Civil Assistant Surgeon, on relief at Coimbatore, is placed at the disposal of the Chairman, Municipal Council, Udamalpet, Coimbatore district, *vice* M.R.Ry. K. C. Tehyunni Menon Avargal, L.M.S., Civil Assistant Surgeon.

M.R.Ry. K. C. Tehyunni Menon Avargal, L.M.S., Civil Assistant Surgeon, on relief at the Municipal Hospital, Udamalpet, Coimbatore district, is placed at the disposal of the President, District Board, Ramnad, for Local Fund Hospital, Sivaganga, *vice* Mr. P. M. Varughese, transferred.

*Posting.*—First-class Military Assistant Surgeon D. H. J. Nicholas, I.M.D., on transfer to the Madras Civil Medical Department, to do duty in the Government General Hospital, Madras, until further orders.

## REVIEWS.

*The Health.*—An illustrated Monthly Journal edited and published by Dr. U. Rama Rau, M.L.C. 323., Thambu Chetty Street, Madras, E. Annual subscription Rs. 1-8-0. Post free. Single copy As. 2 Post free.

Dr. U. Rama Rau is easily the pioneer in Madras in the spread of Health-Education to the general public. This new publication is one more addition to his many other activities in this field. One expects, of course, of a journal edited by so veteran a journalist and sanitarian as Dr. Rama Rau, a high standard of excellence both in respect of the subject-matter provided, as also of the get-up; and it is perhaps needless to add we have not been disappointed in our expectations. The articles are well-chosen and brightly written; the numerous illustrations add greatly to the instructiveness of the Articles. We heartily welcome this new addition to our ranks and wish it every possible success.

## BIRTHDAY HONOURS.

**The only member of our service whose name was included in the last Birthday Honours List is Dr. M. SESHADRI REDDI, L. M. & S., on whom the title of RAO SAHIB was conferred. Our hearty congratulation to RAO SAHIB Dr. M. SESHADRI REDDI.**