

The value of diminished electrical resistance of the human body as a symptom in Graves' disease / by H.W.D. Cardew.

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monkeys and demonstrated the rhythm of the tremor to be from eight to ten per second, which coincides with that of Graves's disease, given by Marie as from eight to nine per second. Von Eisselberg found identical symptoms in man after total extirpation of the thyroid. In fact, such symptoms constitute the "neurotic" stage of Horsley's experiments, and this would indicate that the change in the gland (if there is any) in Graves's disease is in the direction of arrest or profound alteration of secretion. Much has been made of the contrast between this affection and myxœdema; but here, again, the same experiments prove that the "myxœdematous" condition is but a more advanced stage of the "neurotic" and is clinically supported by the fact that the symptoms of Graves's disease may give place to those of myxœdema. Recent opinion points to the secretion of the thyroid gland as "preventing the development of some toxic product in the blood which poisons the system if the gland is removed." It is probable that some change takes place in the nervous system in Graves's disease, giving rise to the characteristic disturbances. In one other condition we meet also with such symptoms—viz., the climacteric period in women. There may be the same emotional state, some amount of fine tremor on occasions, and hot flushings and sweating, and Kisch has called attention to the "rapid heart" of the grand climacteric. One is not infrequently struck with the resemblance of the nervous disorders in both conditions; they are of the "general sort that accompany depressed nervous force in dependence upon a general innutrition" and are referable to some change that has stamped its impress upon the nervous system.

Cardiff.

A NOTE ON POST-PARTUM HÆMORRHAGE.

By JOHN COCHRANE, L.R.C.P. & L.R.C.S. EDIN.,

MEDICAL OFFICER OF THE PARISH OF LOCHGOILHEAD AND KILMORICH,
AND DISTRICT MEDICAL OFFICER OF HEALTH, ARGYLL
COUNTY COUNCIL.

THAT post-partum hæmorrhage is a dreaded complication likely to be encountered at any time is, unfortunately, well known to all, and the following cases which have occurred in my practice illustrate the value of the well-known procedures of compressing and kneading the uterus in this form of hæmorrhage.

A stout young woman was in labour in her first pregnancy. She was of small stature, and when she called upon me previously to her confinement I was struck with the large size of her abdomen, which suggested twins to me; and on seeing her frequently afterwards her whole appearance justified the belief that I might expect some difficulties at labour. She had marks of scrofulous sores on her neck. When summoned to her one evening between 10 and 11 P.M., I found that she had been ill with pains for two evenings previously to her sending for me, but that they had passed off before morning. On making a vaginal examination I discovered that the os uteri was dilated to about the size of a half-crown, that the membranes were ruptured, and the waters drained away. The presentation, which was that of the head, appeared to be normal, but there was a difficulty in ascertaining exactly the actual position, owing to the high presentation. I found there was pelvic contraction, which accounted for the amount of abdominal protuberance, the child being prevented from making the usual descent into the pelvis. I waited for several hours, and as the pains increased in great frequency and strength I examined again. I then found that although the head of the child had descended a little it had become impacted in the pelvis, and that no further progress was being made. As the patient was becoming extremely restless and exhausted, and the pains had much increased in severity, I resolved to apply forceps and expedite the labour. Owing to the large size of the head and he contracted pelvis it required a considerable amount of traction to deliver; some trouble was also occasioned by the body of the child, which was a very large one. The head was elongated to an extraordinary degree by the great pressure exerted on it during its passage. The child when born showed no signs of life, but recovered under artificial respiration. I had no efficient nurse and so had to rely entirely on my own efforts. After allowing the patient a rest of about twenty minutes I proceeded to remove the placenta, which was detached, but on introducing my hand into the uterus I found hour-glass contraction. With my hand within the part

where the placenta, which was a large one, was lying encysted, I had no difficulty in removing it in its entirety. Although I had my other hand outside, grasping the uterus in order to steady and stimulate it, there was immediately a tremendous gush of blood. I continued to grasp and knead the womb until it began to contract well, but at first whenever I relinquished these efforts the hæmorrhage recurred alarmingly. At length, when it ceased and I had bandaged the patient and raised the pelvis, I administered a large dose of ergot. The patient was extremely exhausted and pale, but the kneading process proved quite sufficient to check the flow and thus saved the woman's life. In two other cases which I have seen these processes have been equally efficacious. One was the case of a woman in Skye who had been in labour for three days, and whose attendant, a midwife, was very averse to my being called in. On reaching her I found her in an extremely critical condition and, applying forceps, extracted a living child. I then found a second child present, which I also delivered alive after turning. Shortly after removal of the placenta post-partum hæmorrhage supervened, but in the end kneading, &c., proved successful in arresting it. The other case was a primipara I ascertained some months previously to the time of delivery, on making an external examination of the abdomen, that there was a tumour attached to the wall of the uterus. At term her labour was quite normal up till the third stage, but upon endeavouring to remove the placenta I found, as in the case just narrated, the condition of hour-glass contraction present, and on introducing my hand into the encysted portion of the uterus, where the placenta was, found also an adherent placenta. I detached it carefully bit by bit, for it was in a diseased state; in spite of my care, however, hæmorrhage soon set in so severely and persistently that I was forced to retain my right hand in the uterus for hours, with the left hand externally compressing and grasping the organ before I could induce proper contraction. At last my efforts were rewarded, when the patient rallied wonderfully from her collapsed condition, which required the administration throughout of a considerable quantity of brandy. She afterwards made a good recovery. In this case I am satisfied that the tumour interfered with the proper contraction of the womb, was evidently the cause of the prolonged continuance of the hæmorrhage, and may possibly have had some effect in causing the tetanic spasm of the uterus.

With perfectly clean hands washed in a reliable antiseptic solution I have never found any harm to follow their introduction into the cavity of the uterus, while the fatal results which have now and again followed the injection of such solutions as that of perchloride of iron, even in the hands of careful and experienced obstetricians, must make us chary of employing such methods to arrest hæmorrhage.

Lochgoilhead, Greenock.

Clinical Notes:

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

HARPOON WOUND OF THE LIVER; RECOVERY.

By T. GANN, M.R.C.S. ENG., J.P.,

DISTRICT SURGEON, CORAZAL, BRITISH HONDURAS.

ON Feb. 21st a strongly built man about twenty-eight years of age was admitted into the Corazal District Hospital with the following history. On the previous day he was out in his dory spearing fish on the Rio Nuevo. The harpoon was fastened to its shaft and pointing upwards. He was standing up in the boat when she gave a sudden lurch, throwing him forwards on to the point of the harpoon, which penetrated his abdomen. On admission about twenty-eight hours after the accident he was much collapsed and complained of great pain all round the wound; about one inch of the harpoon (which afterwards proved to be seven inches in length) was seen protruding from a jagged wound immediately below the tip of the ensiform cartilage. Chloroform was administered and an incision six inches in length was made from the harpoon shaft through the abdominal parietes; the peritoneum was opened, and it was then found that the

harpoon penetrated the right lobe of the liver, and on passing the hand backwards along the under surface of the liver the point of the harpoon could be felt projecting through its posterior border. The difficulty of removing the harpoon now presented itself, as it was armed with two sharp, flattened barbs, about three-quarters of an inch long and two inches apart. With considerable difficulty a grooved director was passed down along the shaft of the harpoon, and upon this an incision was made forwards through the liver substance with a bistoury; the harpoon was now pushed backwards in order to disengage its barbs from the liver substance in which they were embedded, and was then easily removed. The peritoneum was washed out with a 1 in 4000 warm perchloride of mercury solution, and nearly half a pint of dark blood-clot removed. The hæmorrhage from the wound in the liver proved troublesome and was not checked for nearly half an hour. The abdominal wound was closed with five deep sutures, and a large indiarubber drainage-tube was inserted along the track of the harpoon. The wound was dressed with iodoform and carbolic gauze. The drainage-tube was removed on the fifth day, and, with the exception of a rise of temperature to 104° F. on the evening of the third day, the patient had no bad symptom and was discharged with the wound firmly healed on the twenty-first day after admission. Corazal, British Honduras.

THE VALUE OF OXYGEN IN OPIUM POISONING.

By W. J. C. MERRY, M.B., B.Ch. OXON.

THE practice of the inhalation of oxygen in cases with embarrassed respiration has been an established fact for some time past, and its use has been attended with varying success. It has been given in asphyxia from coal gas and other causes, and in many acute diseases attended with dyspnoea and cardiac failure. Its value, however, in opium poisoning with intense cyanosis, dyspnoea, and a flagging pulse, does not seem to have been yet put to the test, and the following case may throw some light on the subject.

A man thirty-two years of age was brought to St. Thomas's Hospital by the police. He had been found lying insensible on the Albert Embankment about half an hour previously, and, all attempts to rouse him proving ineffectual, he was conveyed to the hospital. When I first saw him he was somewhat, though not greatly, cyanosed, and breathing stertorously about fifteen times per minute. He was quite unconscious, his corneal reflex abolished, his pupils contracted and inactive, his pulse rapid and weak, and his limbs flaccid. His breath smelt of chlorodyne, and a quantity of brownish fluid with a similar smell was removed from the stomach by the stomach-pump. After this efforts were made to rouse the man from his stupor, and, with this intention, enforced exertions being out of the question, the interrupted current, flagellation, cold affusion, and strong ammonia to the nostrils were successively tried. The ammonia made him cough slightly, but he responded to this combined treatment only to the extent of indifferent protestations when pressure was applied over the supra-orbital notch. The pulse having shown signs of failure at intervals during this time, hypodermic injections of ether were occasionally administered. At the end of about three hours the patient was very little, if at all, better, and as soon as the battery and other restoratives were discontinued he relapsed into profound coma. The united efforts of three policemen failing to make the patient walk, and his condition at the end of four hours' continuous stimulating treatment being serious, he was sent up to the ward. When seen there shortly afterwards his face was intensely blue, and his lips and fingers livid; respiration was very slow (about eight per minute) and laboured. The pulse was scarcely perceptible and unconsciousness was complete. It was then determined to try the effect of the administration of oxygen. This was given in such a way that only the pure gas, undiluted with air, was breathed, and the inhalation was continued without interruption for twenty minutes. At the end of this time the face had regained a nearly normal colour, the respirations were fuller, easier, and slightly quicker, and the pulse was now perceptible at the wrist, beating regularly about 100 to the minute. The patient was, however, still in a state of stupor, though the eyelids now responded slightly to a touch on the cornea. After an interval of about half an hour the inhalation was repeated with marked effect. Shortly after its commencement the man, for

the first time, moved in bed and presently opened his eyes. The whole condition improved so rapidly from this time that before a quarter of an hour had elapsed the patient could tell his name and answer, though in a somewhat rambling fashion, any reasonable question. The inhalations were repeated twice after this for twenty minutes, at intervals of three-quarters of an hour, at the end of which time the patient's condition was so satisfactory that they were discontinued. The man remained in a somewhat drowsy state during the day, but never relapsed into coma, and made a perfect recovery. The patient, on his recovery, alleged that he had drunk two ounce bottles of chlorodyne (a preparation containing, I believe, somewhere about four grains of morphia to the ounce) at midnight—that is, about three hours before the police discovered him. The use of oxygen was suggested by the lividity of the patient and by recent observations upon the destructive effect, apparently by oxidation, of potassium permanganate on morphia. That the oxygen was the turning-point in the case seems to be beyond doubt; but of the exact way in which it acted it is difficult to speak without further experience of its use in similar cases.

I am indebted to Dr. Payne for permission to publish the case. St. Thomas's Hospital, S.E.

A Mirror

OF

HOSPITAL PRACTICE, BRITISH AND FOREIGN.

Nulla autem est alia pro certo noscendi via, nisi quamplurimas et morborum et dissectionum historias, tum aliorum tum proprias collectas habere, et inter se comparare.—MORGAGNI *De Sed. et Caus. Morb.*, lib. iv. Proœmium.

ST. THOMAS'S HOSPITAL.

A CASE OF RUPTURE OF URETHRA TREATED BY IMMEDIATE SUTURE OF THE DIVIDED ENDS OF THE CANAL; RECOVERY.

(Under the care of Mr. WILLIAM ANDERSON.)

ANY method of treatment which is likely to save the subject of a ruptured urethra from the serious results of a traumatic stricture is deserving of attention, and the method described in Mr. Anderson's case is the one which is best calculated to do so. It is most likely to succeed when employed early, but it is not infallible, for when the injury has been severe some sloughing of the urethra, where contused, may follow, and this, combined with the effects of decomposing urine in the tissues, may lead to failure in the most carefully sutured wound. A stricture may follow when there is partial rupture only if the case is treated by the catheter without incision. With regard to these cases of ruptured urethra Mr. Harrison writes: "As a matter of fact, I have observed from a considerable number of cases that rupture of the deep urethra treated by perineal section and bladder drainage, whether a catheter can in the first instance be passed or not, is seldom followed by stricture."

A man thirty-two years of age was admitted into St. Thomas's Hospital on Sept. 15th, 1893. The patient, while jumping backwards off a bicycle, alighted straddlewise on the hinder wheel. On admission he was in much pain; the perineum was greatly swollen and dark from extravasation of blood into the tissues. There was no bleeding from the urethra, and no attempt had been made to pass urine. An attempt was made to pass a catheter, but without success. Ether was then administered, and an incision was made into the swollen perineum in the median line, exposing a large cavity filled with blood clot. After clearing away the extravasation the urethra was found to be completely divided a short distance in front of the triangular ligament, the two ends being separated by a distance of about an inch. An effort was then made to pass a catheter in the ordinary manner, but this was found impracticable owing to the difficulty of fixing the vesical end of the torn canal. A soft No. 10 olivary catheter was then introduced through the wound into the upper opening and pressed on for some distance into the bladder. The other end of the instrument,

the powdered flesh in each meal was increased by $\frac{1}{2}$ oz., until 4 oz. were reached. Some brandy was also given with each meal. This treatment was continued with the best results for fifteen days, when suddenly great irritability of the stomach with persistent vomiting set in. Rectal feeding was then had recourse to for a few days. The bowel was washed out as high as possible, and twice daily the following mixture was injected:—Finely divided beef, 5 oz.; finely divided fresh pancreas, 2 oz.; and lukewarm water, 4 oz.; a little carbonate of soda being added. The patient had in addition a quart of milk daily, both with the gastric as well as with the rectal feeding. Well-marked increase in weight occurred under both methods of nutrition. Accordingly, the latter method was had resort to occasionally, but sometimes $\frac{3}{4}$ oz. of flesh peptones were injected instead of the beef, varied occasionally with 4 oz. of pea-meal that had been artificially digested in water, to which glycerine extract of pancreas had been added, together with a little salicylic acid. Under this purely dietetic treatment, which extended over four months, and was combined with the use of hypophosphites, cod-liver oil, and maltine, this young lady increased greatly in weight, the bacilli disappeared entirely from her sputum, all hæmoptysis ceased, and when I saw her a year and a half subsequently, shortly after she had returned from a long sea voyage, she appeared to be in perfect health, all dulness at the right apex having disappeared, and the respiration become normal. This case is, I think, interesting, as the treatment was almost purely dietetic. Hypophosphites undoubtedly tend to raise the nerve power and to improve the character of the secretions, and accordingly are most valuable tonics in phthisis. I have noticed under their administration an increased expansion of the chest, an improvement in the appetite, and a diminution in the night sweats. Combined with the malt extracts, cod-liver oil, Valentin's extract of beef, and Kemmerich's peptones of beef, they are often of great value. In early cases, also, arsenic may likewise be given with advantage.

7. In some cases in which diarrhoea was very troublesome, good results followed the use of small raw meat balls, alternately with meat peptones and Valentin's extract of meat, opium and bismuth being given at the same time.

8. In three cases I have tried Potain's treatment—that is: sodic chloride, 10; sodic bromide, 5; potassic iodide, 1; water, 100, 2 oz. every morning in a cup of milk. In two cases of caseous phthisis it was of no service, but a case of fibroid phthisis appeared to benefit greatly under its administration.

9. In affections of the throat in connexion with phthisis, I have repeatedly seen great improvement follow the injection into the larynx of 10 to 20 per cent. solutions of menthol in olive oil. In one case, however, it failed completely; but in another, a man aged twenty-four, in whom there were tubercular ulcers in the larynx posteriorly, with tubercle bacilli in the sputum, and some slight alteration in the normal physical signs at the left apex, the ulcers completely healed under the influence of the menthol injections, menthol also being given internally. Having lost sight of this patient, I, however, can say nothing as to how he has progressed.

Albert Mansions, S.W.

(4)

THE VALUE OF DIMINISHED ELECTRICAL RESISTANCE OF THE HUMAN BODY AS A SYMPTOM IN GRAVES' DISEASE.

By H. W. D. CARDEW, M.R.C.S. ENG.

It is, perhaps, advisable to recall a few well-known physical and physiological facts bearing on this subject before proceeding to discuss it. Regarded from an electrical point of view all bodies are classified as conductors or non-conductors. Bodies which allow the free passage of electricity through their substance are called conductors, the term bodies being used in a general sense. Those which do not allow the free passage of electricity through their substance are called non-conductors, it being an accepted fact that every substance permits of some movement of electricity in itself. Electrical resistance is the reciprocal of electrical conductivity—thus: if X has a resistance of 1 ohm and Y a resistance of 10 ohms, we may say that the resistance of Y is ten times that of X; or, that the conductivity of Y is one-tenth that of X. It is customary, however,

and more convenient, to speak of the resistance of substances when wishing to compare that property in definite terms of measurement. The unit of resistance is called an ohm, and is arbitrarily taken to be that offered by a column of mercury at 0° C., 106 centimetres in length, with a section of 1 square millimetre. In order to create a readily comparable standard of resistances for various substances, a definite quantity (one cubic centimetre) is taken of each substance at a definite temperature, and its resistance measured from face to face. Such resistance is known as the specific resistance of each substance, and a glance at a table of such specific resistances enables us to see the relative conductivity of the various substances. The specific resistance of solid conductors is easily found, but in attempting to calculate that of a liquid we are confronted with certain difficulties. We take the same amount at the same temperature of the various liquids, but it is not easy to be so sure of its definite composition and strength if a solution, as in the case of a solid, such as a metal. Further, a fluid conducts by convection, being electrolysed by the passage of a current through it, and this electrolysis sets up a counter electro-motive force, which opposes the current, and is yet not true resistance. Many methods have been introduced for minimising these difficulties.

The following table of specific resistances will be of use, as bearing on the subject:—

Copper annealed,	1.598	microhms (one millionth of an ohm).
Silver annealed,	1.504	"
Graphite,	41800	"
Sulphate of zinc solution with density,	1.2891	= 28.3 ohms.
Sulphate of copper solution	1.2051	= 29.3 "
Water (pure)	9320	"

Taken from Jenkin on Electricity and Magnetism. The temperature of the first two was 0° C.; of graphite, 22° C.; of solution, 10° C.; of water not stated.

This table demonstrates the fact that though a saline solution has not the high conductivity of copper and silver, it may yet be regarded as a fairly good conductor. It is a recognised fact, and one easily proved, that the human body conducts solely by virtue of the fluid contained in its tissues, the conductivity of each tissue being in direct proportion to the quantity and conducting quality of the contained fluid. This resembles the manner in which a silken thread, itself a non-conductor, after being moistened with a conducting fluid, conducts by virtue of the conducting fluid contained in its interstices. Any one tissue of the human body is, when freed from fluid, a non-conductor; but it can be converted into a conductor by soaking it in a hot saline solution, provided that it allows the fluid to occupy its minute interstices. Through the kindly courtesy and with the assistance of Professor Stewart, I examined two mummies in the Museum of the College of Surgeons, with a view to see if they acted as conductors. These mummies were prepared in 1779, and may reasonably be looked upon as human bodies free from their fluid constituents. I used an electro-motive force of 60 volts; the galvanometer used would show 0.00001 ampere. Bare ductile metal electrodes, connected with the battery and galvanometer, were placed in various portions of the mummy examined, but there was no deflection of the galvanometer. A simple calculation shows, therefore, that the resistance of each mummy must have been over 6,000,000 ohms. Other dried tissues have acted in a similar manner. We are, therefore, justified in accepting as a recognised fact that the human body conducts solely by virtue of the fluids contained in it. These different fluids are, to all intents and purposes, saline solutions containing a variable amount of different salts. They may be regarded from our point of view as fairly good conductors, remembering the conductivity of those solutions enumerated in the table of specific resistances. Regarding the human body as conducting solely by virtue of these different solutions contained in the various tissues, we should expect to find it a good and not a bad conductor. How comes it then that there is such an enormous difference between their conductivity, when contained in the various tissues of the body, and what we are led to believe by analogy would be their conductivity if examined external to and separate from the body. The difference is not due to them, but to the different conditions of the two experiments. When examined separate from the body, they would be in direct contact with the electrodes; when examined as part of the body there is placed between the electrodes and the fluid a layer of non-conducting material which

would be a complete non-conductor were it not for minute orifices and interstices contained in it, which perforations contain a variable quantity of fluid. This non-conductor is the stratum corneum of the epidermis, consisting of cells which, as they approach the surface from the deeper portion of the skin, become dry from evaporation and horny from conversion of their protoplasm into keratin.

When we recall the statement that the human body free from fluids is a non-conductor and apply it to this tissue, we see at once why it is a bad conductor, and why it is that were it not for the minute interstices between the cells, the openings of the sweat glands, sebaceous glands, and hair follicles, containing a conducting medium naturally or artificially placed there, it would be a complete non-conductor. We may assume that it is to this layer the body owes its high resistance, this being borne out by the fact that the resistance of the body is different according as to thickness and the number of orifices in the portion of this structure covered by the electrodes. It has also been demonstrated that the resistance of a definite portion of the human body is enormously diminished by removing the epidermis. A simple way of demonstrating this theory to be correct is the manner adopted by us in the percutaneous method of applying electricity. We reduce the resistance of the stratum corneum by either sponging the skin with hot water (the resistance of fluids is diminished by heating them), or a hot saline solution, or by soaking the coverings of the electrodes in the same fluids; or better still by doing both. In either case the fluid enters the intercellular interstices and the other perforations of the stratum corneum by capillary attraction, thus forming a conducting medium between the moist structures immediately beneath it and the electrodes placed on it. The further reduction of its resistance depends on the electro-motive force of the battery and the duration of the application up to a certain point. I examined one patient, and with all conditions of both examinations the same, bare metal electrodes being used, I found the resistance 60,000 ohms before and only 3764 ohms after moistening the skin with a hot saline solution.

In applying the various physical facts to the study of the human body as a conductor, we see at once that it is not possible to assign a specific resistance to it. The conditions affecting its conductivity are so diverse that enormous variations in the resistance are found in the same body. We cannot take any definite portion of a body for a type of the whole of the body as regards its structure and composition. Since it conducts by virtue of the fluid contained in it, we meet with all the difficulties enumerated when speaking of the specific resistance of a fluid, this being further complicated by the fact that the electrodes are not placed so that their whole superficial area is in contact with a corresponding superficial area of fluid; and, further, that the sectional area and length of the column of fluid vary. But in examining the resistance of human bodies, for the sake of comparison, there are certain conditions we can control, and then our results are of some importance. Such conditions are to use electrodes, made of some ductile metal, having a definite superficial area, to apply them bare to definite portions of the bodies, to ensure as much as possible that the number of orifices in the stratum corneum beneath them are approximately the same. This is important, for we must regard these orifices as containing threads of the conducting medium, and therefore the greater the number of these threads beneath the electrodes, the less the resistance will be, since resistance diminishes with increasing sectional area and increases with the length of a conductor. The electro-motive force of the battery used should be the same in all cases. Other conditions vary with the method adopted of estimating the resistance.

The first to call attention to the fact that the bodies of those suffering from Graves' disease offered a very diminished electrical resistance was Dr. Charcot. He did not say that it was present in all, but only in the majority of such cases. He states in a lecture on this disease¹ that in it we have a symptom of great value, and likely to be of great importance in the diagnosis of atypical cases (*formes frustes*). That it is present in the majority of cases I believe to be certain. I found it present in fifteen out of twenty cases. That it is a symptom of great or even any value, I would venture, with all respect for such a distinguished

observer, to deny. My attention was called to this condition when I first had the opportunity of carrying out the electrical treatment for Dr. Sansom in some cases of Graves' disease. One noticed that in the majority of these cases the electro-motive force necessary to produce at once the desired current strength was very much less, all other conditions of the application being the same, than in patients suffering from other diseases, such as facial paralysis—that is to say, the resistance offered at the commencement of the application was very much less than usual. Thus, with all conditions of the examinations the same, I found in the majority of patients suffering from Graves' disease an average resistance of about 3000 ohms, as against from 30,000 ohms and upwards, according to circumstances, related further on, in other cases. This being the case, on recalling the conditions by which the human body conducts, one naturally attributes this enormous difference to some change in the resistance of that portion of the body (the stratum corneum) which offers the greatest part of the whole resistance. This was the condition found. Most patients suffering from Graves' disease perspire more or less profusely, and as evaporation does not take place at a rate equal to that of the secretion, the stratum corneum is covered with sensible perspiration, and its intercellular interstices and the orifices piercing it are filled with this saline solution, which forms an excellent conducting medium between the internal fluid of the body and the electrodes placed on it. This deduction I found confirmed in my own cases, as pronounced diminished electrical resistance such as described occurred only in those patients in whom the perspiration was sensible. I thought, however, that, incontrovertible as this explanation of the diminished electrical resistance was to me, it would be advisable to examine a number of other cases. By the kindness of Dr. Sansom, and with the assistance of his house physician Mr. Reynolds, I examined a number of suitable cases in his wards at the London Hospital. In addition to these I examined in the out-patient department of the London Hospital, by the kind permission of Dr. Ralfe and Dr. James Anderson, a large number of out-patients. I take this opportunity of thanking these gentlemen for so kindly affording me the necessary facilities for obtaining the information I desired.

I found it practically impossible to estimate the resistance in all these cases by the Wheatstone Bridge method for obvious reasons, and therefore adopted the plan of estimating it by means of Ohm's law. This is usually written as an

$$\text{equation } C = \frac{E}{R} \quad (C \text{ being the current strength in amperes,}$$

E the electro-motive force in volts, R the resistance in ohms); R being the quantity I wished to find out, the

$$\text{equation for this purpose being written } R = \frac{E}{C}. \quad \text{The electro-}$$

motive force I estimated with a voltmeter, and the current strength with a galvanometer. These two factors being known, a simple calculation gave the required R. My method of procedure was as follows:—I used a 4 cell (chloride of silver, Schall) battery, having an electro-motive force of 6.4 volts and an internal resistance of 1.2 ohms; a galvanometer, which was graduated in ten-thousandths of an ampère, having a resistance of 200 ohms. A deflection signifying 0.0001 ampère, with the electro-motive force 6.4 volts, therefore showed the resistance in circuit to be 64,000 ohms. This, less the 200 ohms resistance of the galvanometer, and the 1.2 ohms resistance of the battery, would represent the resistance of the portion of the human body being examined, the equation being $R(64,000) = \frac{E(6.4)}{C(0.0001)}$.

In describing the cases below, when I say that the resistance was more than 64,000 ohms, I mean that with such an electro-motive force and such galvanometer put in circuit with a patient, the deflection was not equal to 0.0001 ampère, my object not having been to ascertain the exact resistance when high, but merely to establish the difference between the two extremes, high and low. I further ignore the other resistance in circuit—namely, that of the battery and galvanometer—in stating the resistance to be over 64,000 ohms. The electrodes used were of ductile metal, to allow of their adaptability to the body surface, and circular in shape, having respectively a diameter of three and one and a half inches. The large one was placed on the nape of the neck so that the centre of its lower border corresponded to the centre of the seventh cervical spinous process; the smaller one on the manubrium, so that the centre of its upper

¹ Gazette des Hôpitaux, Jan. 31st, 1885.

border corresponded to the centre of the sternal notch. The electrodes were applied bare and dry, care being used to keep their surfaces clean and bright. The current was allowed to flow for ten seconds. Thus I venture to think that the conditions of the examinations were the same in all cases, so far as those under my control were concerned. The site of the electrodes is convenient of access, and has constant landmarks for accuracy of position. The actual examination consisted of five steps: (1) applying the electrodes; (2) switching in a voltmeter and noting the electro-motive force; (3) withdrawing the voltmeter and switching the patient with galvanometer simultaneously; (4) switching the patient with galvanometer out of circuit at the expiration of ten seconds, and switching in the voltmeter again to note the electro-motive force; (5) calculating the resistance of the portion of the body examined by the equation

$$R = \frac{E}{C}.$$

The following are notes of some of the cases examined by me:—

Healthy adult male, examined three times in the twenty-four hours; the first time, immediately after undressing at night (he wore flannel next the skin), perspiration sensible to couch and sight, $R = 2438.8$ ohms; the second time, ten minutes later, the subject having remained with chest and back bare to allow evaporation, previously interfered with by his clothing, to take place freely, $R = 4713$ ohms; the third time, the following morning, the subject slept in a cotton night-shirt, perspiration insensible, $R = 32,798$ ohms. This great difference would be due to diminished perspiration with increased evaporation during the night. These three examinations were made in moist warm weather. I therefore examined the subject again during dry, cold weather, and found, all conditions of the examination being the same, that the resistance at similar periods was respectively 3167.2 ohms, 8941.6 ohms, and over 64,000 ohms. This was due to diminution of perspiration and increase of evaporation being influenced by atmospheric conditions. A large number of out-patients were examined, some before being exposed for the purpose of physical examination, and some after their chests and backs had been exposed for this purpose. The resulting resistances found varied in all degrees from 3000 ohms to over 64,000 ohms, the recently stripped patients offering the lowest, and those examined some minutes later the highest resistance; whilst, on re-examining those offering low resistance immediately their chests and backs were exposed, some minutes later, the resistance had increased according to the time they had been exposed for physical examination, and in proportion to the amount of original perspiration and the rate of evaporation. These cases were all of them suffering from the various chronic disorders such as are usually met with in out-patient departments. In every case where the resistance was markedly low, the portion of skin to which the electrodes were applied was covered with perspiration sensible to the touch and sight. Of acute cases I examined in the wards of Dr. Sanson at the London Hospital, the following two will be sufficient to quote. One, a young woman suffering from subacute rheumatism, was perspiring moderately when I first examined her on the night of her admission; R found to be 2899.8 ohms; ten days later perspiration insensible, over 64,000 ohms. Another case, that of a man, was 3563.5 ohms when perspiration was sensible but moderate in amount, and 31,798.8 ohms when perspiration was insensible. In the case of a healthy male adult examined by the Bridge method, I reduced his resistance from 80,000 ohms to 1900 ohms by administering hot spirituous drink to him, then putting him in a hot room and covering him with thick clothes until he perspired excessively. In this case the electrodes were the same as regards size, position, and all other conditions as in the experiments described above. It is not necessary for me to enumerate the results of other examinations, as I venture to think that those described above are sufficient to support my contention that markedly diminished electrical resistance of a definite portion of the human body signifies merely that the portion of skin covered with the examining electrodes is moist with sensible perspiration. Such being the case, I leave it for those who read this statement to assign that condition its proper value. If the existence of sensible perspiration is regarded as a diagnostic symptom of any value, then, as it is sensible to our touch and sight, any corroboration by means of special apparatus is unnecessary. If, on the other hand, the question of perspiration being

sensible or insensible depending on such a great number of circumstances, it is not to be regarded as a symptom of value. This being my opinion, such evidence for or against the presence of sensible perspiration is absolutely unnecessary.

Harley-street, W.

CASE OF

MEGRIM, ACCOMPANIED WITH PARALYSIS OF THE THIRD NERVE, AT FIRST TRANSIENT, BUT SUBSEQUENTLY BECOMING PERMANENT.

By E. N. NASON, M.B. CANTAB., M.R.C.S.

THAT megrim is sometimes accompanied by paralysis of the third nerve is well known, but that this transient and generally called functional paralysis should become permanent is extremely unusual. This, with some other points of interest in the following case, is I think sufficient reason for its publication.

George C—, aged twelve years and a half, the child of healthy parents, was brought to me last September, having suffered for the last five years from recurrent attacks of the following nature. An attack begins with a feeling of languor and general weariness. The child is at the same time extremely restless, wandering about unable to settle to anything, or to attend school. This prodromal stage often lasts from one to even three days, and is accompanied towards the end of this time by continued slight but increasing pain in the left frontal region. Then suddenly there supervenes a period of from twelve to twenty-four hours characterised by intense nausea and vomiting, associated with pallor; irregular, slow, and feeble pulse, and great prostration. The pain now rapidly increases, and soon becomes agonising. This pain is referred to the course of the supra-orbital nerve of the left side, but is also felt over the occipital protuberance, but much less severely. There is at the same time increased lacrymation and a discharge of watery mucus from the left nostril, great intolerance of light, prominence of left eyeball and increase of intra-ocular tension, wrinkling of left side of forehead, with fibrillar twitchings of the frontalis, &c. Gradually increasing paralysis of the third nerve then follows, the various branches of that nerve being affected in the following order of severity: the levator palpebræ superioris, rectus superior, and obliquus inferior are completely paralysed. The rectus inferior is almost completely paralysed, and the rectus internus is partially paralysed. The pupil remains midway between contraction and dilatation, and reacts but slightly to light or accommodation, the reactions being anomalous. To light there is a momentary, almost imperceptible, contraction, followed by a slight permanent dilatation. The pupil dilates, too, slightly when the patient looks from a distant to a near object. There is also marked double vision over the whole field visible to both eyes. During the height of the attack the child seems extremely ill. His face is pallid and the expression anxious; tongue furred; bowels confined; the urine scanty and high-coloured. There is complete anorexia. After a variable time the pain leaves him almost suddenly, the sickness abates, the appetite at once returns, and within a few hours he feels quite himself again. The paralysis however, remains for a day or so, but gradually passes off. Lately these attacks have become more frequent and more severe, and have left more and more residual paralysis, till at the present time there is almost as much paralysis between the attacks as during one. There is no optic neuritis or atrophy or other appreciable change in either fundus, but vision, especially in the left eye, is much impaired, enabling him to do little more than count fingers at three feet with that eye. There is no family history of epilepsy, megrim, or other kindred neurosis, or of syphilis in either parent. The mother gives the following history: The child was quite healthy up to four years of age, when he had scarlet fever rather badly, but this was not followed by any discharge from the ears. Since then he has suffered at frequent intervals from severe "colds in the head," and from what the mother calls "sick headache," also from occasional nocturnal incontinence of urine. She dates his present attacks from his seventh year, and says they have continued at intervals of from three to four weeks ever

since. If he goes beyond four weeks without an attack, the next is proportionately severe. Between the attacks he appears to be in good health, and is an intelligent though rather ill-developed boy. He is also the subject of double undescended testicle.

This case is probably a variety of megrim, and certainly should be classed among the paroxysmal neuroses. The nuclei of the third and fifth nerves of the left side are probably first affected, the "storm" spreading also to the nucleus of the vagus, as evidenced by the vomiting and irregular cardiac action. If we regard these storms as of vaso-motor origin and consisting of spasms of the arterioles supplying these nuclei, an explanation of the permanence of the paralysis suggests itself. If the nucleus of the third nerve were repeatedly deprived for some length of time of its proper nutritive supply, what was at first a mere functional derangement might ultimately become an organic change, and partial atrophy of the nervous elements might result, having for its visible effect permanent paralysis of the muscles supplied from that centre.

Nuneaton.

A Mirror OF HOSPITAL PRACTICE, BRITISH AND FOREIGN.

Nulla autem est alia pro certo noscendi via, nisi quamplurimas et morborum et dissectionum historias, tum aliorum tum proprias collectas habere, et inter se comparare.—MORGAGNI *De Sed. et Caus. Morb.*, lib. iv. Proæmium.

LONDON LOCK HOSPITAL.

INCONTINENCE OF FÆCES, FOLLOWING PHAGEDÆNA,
TREATED BY INGUINAL COLOTOMY; RELIEF; REMARKS.

(Under the care of Mr. J. ERNEST LANE.)

The history of this patient helps to confirm the statement that "the occurrence of phagedæna is almost invariably a concomitant of the infecting sore"; for at the time when the patient suffered from the ulceration there was evidence of constitutional infection. We rarely meet with the phagedænic sore, with its rapid destruction of tissue, at the present day; and although cases similar to the one described are recorded, still such an extensive cicatricial deformity is luckily most uncommon. The unusual position of the intestine with regard to the artificial anus is of importance in view of such a procedure as that referred to by Mr. Lane.

M. B., aged twenty-eight, single, was admitted as an in-patient to the Female Lock Hospital on Feb. 4th, 1890. The history was that nine years previously she had contracted a syphilitic sore of the labium, which subsequently took on phagedænic action, the destructive ulceration spreading to the rectum and nates, destroying completely the labia and nymphæ, and spreading thence forwards to the pubes and outwards on to the thighs. She was under treatment at one of the metropolitan hospitals, and subsequently at an infirmary. The sore was followed by a severely ulcerated throat.

The condition of the patient on admission was as follows. She was a spare woman, of good family history, with an anxious expression of face; she had not menstruated for eight years. The vaginal and anal orifices had been completely destroyed by a severe ulcerative process, which had in some places become cicatrised over, while in other parts the scar tissue had broken down, leaving extensive and unhealthy ulcerated surfaces. Examination under an æsthetic revealed the following condition: An oval opening with tough indurated edges existed in the perineum and admitted the finger into a species of cloaca, for the recto-vaginal septum had been destroyed for some distance; with the extremity of the finger it was possible to make out two circular apertures—one, the larger, leading backwards presumably towards the rectum, while the other led forwards towards the vagina; both these openings were surrounded by dense cicatricial tissue, and barely admitted the tip of the index finger. No urethral aperture could be discovered, but it was ascertained by the nurse that the urine was voided partly through the cloacal orifice, and partly through two minute fistulæ on either side of this. From the perineum ulceration had spread upwards to the groins; cicatrization had taken place, the result being that the thighs were

maintained in a slightly flexed position, while, owing to the contraction of the scar tissue between the thighs and perineum, abduction was only permitted to a very limited extent. The result of this examination was a severe rigor, and a rise of temperature to 105°; the hyperpyrexia disappeared on the following day. The most distressing feature of the case was complete incontinence of fæces, which prevented the patient from moving about or undertaking any duties. Whenever she rose from the sitting posture there was an escape of liquid fæces, in consequence of which she was shunned by her fellow-patients, and her life was one of abject misery and enforced solitude.

As she was willing to submit to any operative procedure, it was decided to have recourse to inguinal colotomy, and accordingly on March 14th, assisted by Mr. Cotes, that operation was performed in the usual manner, and with the strictest antiseptic precautions. To lessen the tendency to prolapse of the mucous membrane through the artificial opening, the sigmoid flexure was drawn downwards as far as possible, and with a view to creating an efficient spur the bowel was drawn forwards so that quite two-thirds of its circumference were placed in front of the sutures attaching it to the abdominal wall. On March 20th, the patient having felt no inconvenience from the operation, and the temperature not having once risen above the normal, the bowel was opened and some flatus escaped; three days afterwards there was a copious evacuation of the bowel, and within three weeks from the time of the operation the patient had recovered from its effects.

The condition of the patient in August, five months after the operation, was as follows:—Her general appearance had greatly improved, and she was in the best of spirits. She was wearing an abdominal belt with a plug projecting into the artificial anus; the bowels were opened regularly once a day; there was scarcely any prolapse of the mucous membrane, and no passage of fæces by the aperture in the perineum. On a close examination it was found that the fæces escaped from the lower extremity of the artificial anus, and on passing the finger downwards into the lower of the two portions of bowel attached to the abdominal wall, this was found to contain moist fæces, while the mucous membrane of the upper segment was dry and its cavity was empty. The significance of this unusual circumstance is explained below. Since the patient was discharged from the hospital she has been menstruating regularly through the cloacal opening in the perineum, though before the operation the menses had been absent for eight years. The cicatrix in the perineum was contracting, and the aperture into the cloaca was smaller.

Remarks by Mr. LANE.—Hitherto inguinal colotomy has seldom been performed except for the relief of those suffering from stricture of the rectum, such stricture being in the majority of cases malignant in nature. Mr. Harrison Cripps records a case in which the operation was done for the relief of a recto-vesical fistula; in my case, as in Mr. Cripps', the operation was one of expediency. The condition of the patient was a very distressing one, still it was not one which would endanger or shorten life, and the only object of the operation was to enable her to resume her household avocation, by ridding her of the intolerable annoyance to which she was subjected by the constant escape of fæces. It was with a feeling of considerable responsibility that I undertook an operation which can hardly be said to be devoid of danger, and it is a matter of congratulation to me that the proceeding has been fully justified by the result. It was not till a considerable time had elapsed after the operation that it was discovered the fæces escaped from the lower part of the artificial anus, and not, as one would naturally expect, from the upper end of that opening. The reason of this condition of things I presume to be as follows:—At the time of the operation the sigmoid flexure, owing probably to the existence of a long and loosely attached meso-colon, was twisted upon itself somewhat as in a volvulus. If this condition exists it must be difficult, or even impossible, to discover it at the time of operation, and it will only be ascertained by close examination of the artificial anus; after a time the distal end of the bowel becomes dry and empty, the proximal end being naturally moist and containing fæces. This occurrence is of course well known to surgeons who have had much experience in abdominal surgery, but hardly sufficient stress has been placed upon it in the published accounts of the operation; it has been mentioned in discussions at the societies, but has