stay at home. He was a well-nourished, healthy-looking youth. He walked with difficulty, holding on to a bed near him, and lifted his feet high to prevent the toes from dragging. He could stand with his eyes closed. There were decided weakness of the flexors and extensors of the leg and great weakness of the flexors of the feet. Sitting with the leg at a right angle to the thigh he was unable to raise the fore part of his feet off the floor. There was no pain on compressing the calves. The knee-jerks and plantar reflexes were absent. The cremasteric and abdominal reflexes were lively. There was some analgesia of the whole surface of the trunk, the face, and the limbs, which was most marked on the left side, and there was tremor of the hands and lips and closed eyelids. There was some restriction of the colour field, especially of the left eye. The taste was somewhat impaired and he could not detect solution of quinine on the tip of the tongue. The sense of smell was normal. There was pain occasionally under both nipples. The upper extremities, the electrical reactions, and the pulse (114) were normal. The apex beat was normal in site. There were systolic murmurs, probably functional, at the apex and the pulmonary areas. The temperature was usually normal night and morning, sometimes touching 100° F., at other times 99°. The urine was normal excepting for a little pus; the pus-cells contained gonococci. Cultures of blood taken on the 15th revealed nothing. He was ordered bicarbonate and citrate of potash at first and subsequently a tonic with massage. He was able to walk well at the end of six weeks and was discharged on April 20th.

The symptoms here pointed, in my opinion, to a neuritis chiefly involving the motor fibres of the peripheral nerves of the lower extremities and causing muscular weakness and pseudo-tabes. He also had some of the stigmata of hysteria—namely, general analgesia most marked on the left side, some restriction of the visual fields, tremors of the hands and eyelids, some impairment of taste, &c. He was undoubtedly hysterical, but, in my opinion, the paralytic troubles were not due to this disorder. Hysterical paralysis is usually associated with much loss of sensibility of the limbs affected; the sensation in this lad was no more impaired over the legs than elsewhere. The absence of the knee-jerks, the loss of the motor power of the flexors of the feet, and the tingling in the toes, pointed to a neuritis. Like the other patient, there was, for a certain period, joint trouble indicating general gonorrhoeal infection. In both cases the discharge was not perceptible on admission but required treatment subsequently. Both patients were of neurotic temperament; the patient in the second case suffered from migraine and was hysterical. The other patient had a mother who was an asthmatic subject and he bore the marks of degeneracy. In this neurotic condition we have the predisposing cause, rendering their nervous tissues susceptible to the action of toxins. Raymond observes, "All intoxications seem to me capable of developing a polyneuritis in a subject tainted with a neurotic constitution."

I may point out that it is not possible to obtain positive proof of the causal relation of the gonorrhoea and the paralysis in my cases or in similar cases ending in recovery. The probability of the correctness of the diagnosis rests upon the following facts. Peripheral neuritis is invariably due to some intoxication, often to bacterial infection. Many cases of peripheral neuritis have been set down to gonorrhoeal infection, and experiment has indicated that the toxin of the gonococcus is capable of exerting a morbid influence on the nervous tissues—central and peripheral. In my patients there was evidence of gonorrhoeal infection in the joint trouble and no other source of intoxication could be discovered. I recognise this to be a weak point in the argument, because, in some few cases of multiple neuritis, poliomyelitis, and Landry's paralysis no origin of intoxication can be recognised.

Liverpool.

BARTON REGIS WORKHOUSE.—The Right Hon. Sir John Dorington, Bart., M.P., formally opened, on Sept. 18th, the new workhouse of the Barton Regis union, which is situated at Westbury-on-Trym, near Bristol. The institution stands on 13½ acres of land, will provide accommodation for 110 inmates and 24 casuals, and has been erected at a cost of £33,000. The infirmary contains two wards of six beds each, two smaller wards of four beds each, and also two isolation wards of one and two beds respectively.

OPERATIONS UNDER ANALGESIA PRODUCED BY INTRA-SPINAL INJECTIONS OF COCAINE.

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THE article in THE LANCET on anæsthesia produced by intra-spinal injections of cocaine which appeared early in 1901¹ induced me to try the method, and the annotation in THE LANCET of April 12th, 1902, p. 1051, suggested to me that probably my experiences might be interesting to other surgeons. My house surgeon, Dr. A. Morton, has very kindly collected my cases and abstracted the notes which I now offer for publication. In addition to these are the notes of a case operated on by my colleague Mr. Ward who has kindly allowed me to publish it. After following the detailed instructions given in your article I had practically no difficulty in puncturing with the needle and introducing the fluid, the resistance offered by the subflavus ligament was readily appreciated, and pushing the needle a little further the cerebro-spinal fluid soon began to flow in small drops. After injecting the cocaine I injected a little sterilised salt solution to wash out the needle to be quite sure that I had introduced the full dose. I do not think that I have ever been more impressed in my life than I was with the first case and I believe that all who saw the operation were equally impressed. It was difficult to realise that within a few minutes of introducing a third of a grain of cocaine into the spinal canal one could deliberately amputate through the knee-joint, the patient being conscious all the time and yet not feeling any pain. In all the cases with the exception of the one operated on in April, 1901, it answered admirably. This patient was a very nervous man and I think it was more from fear than from pain that he cried out. I was not quite satisfied that I had given him a proper dose and the solution of cocaine had been twice sterilised, which may have altered its composition. The faintness of some of the patients was a little alarming; two or three of the patients I gave a hypodermic injection of 10 minims of liquor strychniæ before the injection, and this, I think, had a good effect. In your article you refer to the conservatism of English surgeons. One can well understand this attitude towards anæsthetics, which are now, as a rule, so well given and with such excellent results both for patients and surgeons that any new methods must have a great deal in their favour before a trial is ventured on. I was really induced to try the method in the first case because I felt a general anæsthetic of any kind would be a serious factor in the case, and I certainly believe there are some cases where this means of producing analgesia must be useful and valuable. I have not operated on any case by spinal cocainisation since April, 1901, and I may fairly be asked, Why? I do not feel it is so immensely superior to other methods; my last case was not quite a comfortable experience; the fact that the patients are conscious of what is going on is to some very distressing, and I think I rather shirk the dual responsibility of acting both as anæsthetist and surgeon. The cases are arranged in chronological order.

CASE 1. Senile gangrene of both feet; Stokes's amputation; right side.—The patient was a man, aged 58 years. Operation was performed on Jan. 24th, 1901. Intra-spinal injection of a quarter of a grain of cocaine was given. Operation was commenced eight minutes after the injection. The patient felt no pain during the operation, although he felt a vibrating sensation when the bone was sawn. The pulse increased from 96 to 108 and was intermittent. He sweated profusely towards the end of the operation. Respiration was laboured. He retched a little and tried to vomit, but this gradually passed away. About three-quarters of an hour after the operation he began to recover sensation in the stump. He took food soon after the operation. For the first week he appeared to be making good progress, the stump healing well. On Feb. 4th the patient died suddenly without any previous indication of failing except the pulse, which had been feeble and irregular both before and after the

¹ THE LANCET, Jan. 12th, 1901, p. 137.

operation. His peripheral arteries were most of them rigid and calcareous.

CASE 2. *Senile gangrene of the foot; Stokes's amputation.*—The patient was a man, aged 43 years. Operation was performed on Jan. 28th, 1901. Intra-spinal injection of one-third of a grain of cocaine was given. There was partial analgesia to pricking three minutes after injection and total analgesia to pricking four minutes after injection, not only in the lower limbs, but to a point two inches above the umbilicus. Operation was commenced seven minutes after injection. The patient felt practically no pain during the operation; a violent contraction of the thigh muscles when the great sciatic nerve was divided caused slight pain. The sawing of the femur and patella caused a jarring sensation but no pain. The patient was quite quiet during the whole of the operation. His colour remained unaltered and his breathing undisturbed. The pulse fell from 120 to 80 and became less in volume. There was slight sweating but no vomiting. The pupils became smaller. After the operation was over he complained of thirst and he had a few ounces of water; this he vomited back again in a few minutes. During the rest of the day the patient slept quietly. He complained of some pain at times and tingling in the legs. In the evening he had two slight epileptic seizures. Between and after these he was drowsy. He made a good recovery.

CASE 3. *Hydrocele of the tunica vaginalis; radical cure.*—The patient was a man, aged 55 years. Operation was performed on Jan. 28th, 1901. Intra-spinal injection of one-third of a grain of cocaine was given. In about five minutes from injection the patient said he felt an advancing numbness in the limbs and a minute later he could not feel pain in the scrotum when it was being pinched, although he could feel it being touched. Operation was commenced seven minutes after the injection. The patient felt no pain during the whole of the operation. He felt the fluid from the hydrocele trickle down his thigh. During the operation the patient became ghastly white and the pulse was very rapid and almost imperceptible; at this time he felt very sick but spoke when questioned quite naturally and said that he felt no pain anywhere, only a little tightness across the chest and a sinking feeling in the epigastrium. He was given 10 minims of liquor strychniæ hypodermically; the pulse re-acted immediately and became slower and fuller, though the patient was still very pale. General sensations, including sensations of heat and cold (which were tested), were retained, he could feel no pain from a pin-prick, although he knew that he was being pricked by a pin. He was given a little brandy at the end of the operation. This was promptly vomited and he continued vomiting and retching for a few minutes after this. An hour after operation the pulse was 98, regular, and less easily compressible; pallor was much reduced. He was having some tea. He complained of a little tightness across the chest. The skin was clammy and perspiring. He had clonic spasms in the lower extremities.

Notes by Dr. W. H. M. Telling.—Three minutes after the commencement the pulse was 88 and numbness was felt in the soles of the feet. Four minutes after the commencement numbness was felt in the knees. Five minutes after numbness was felt in the scrotum. Eleven minutes after an incision was made. The pulse was 68. The patient got rapidly paler, collapsed, and the pulse could not be felt. Fourteen minutes after ten minims of strychnine were injected hypodermically. Fifteen minutes after brandy was given by the mouth; the pulse was better (64). Eighteen minutes after the operation ended. The patient vomited a little. He made a good recovery.

CASE 4. *Inguinal hernia; radical cure; Bassini's operation.*—The patient was a man, aged 34 years. Operation was performed on Jan. 30th, 1901. Intra-spinal injection of one-third of a grain of cocaine was given. The patient was quite conscious during the whole time. Although quite free from pain he could feel the touch of anything. Two minutes after commencement the pulse was 100. Three minutes after numbness was felt in the toes. Five minutes after numbness was felt in the knees. In six minutes the scrotum was analgesic. Seven minutes after the pulse was 80. Eight minutes after an incision was made; the patient felt the cutting sensation but no pain. Nine minutes after the pulse was 44. The patient felt sickly and hot, his lips were paler, and he vomited with some straining. Twelve minutes after the pulse was 52. Fourteen minutes after the hands were numb and he was sweating slightly. Fifteen minutes after he was sweating profusely and there was an aching

sensation at the site of the wound. Seventeen minutes after the pulse was 62. Twenty-five minutes after the pulse was 88. Twenty-six minutes after the patient winced slightly and complained of sensation of weight. Thirty minutes after he felt the pulling of tissues, when the deep stitches were put in. Thirty-three minutes after the pulse was 88 and the operation was ended. He felt the superficial stitching, but it was not painful. Sensation to heat and cold was lost. Although the patient got collapsed slightly and faint when the pulse was slowest there was never any real anxiety as to his condition. Vomiting improved the pulse. The patient had a chop for dinner. He made a good recovery.

CASE 5. *Radical cure of inguinal hernia; Bassini's operation.*—The patient was a man, aged 26 years. Operation was performed on Feb. 4th, 1901. Intra-spinal injection of a quarter of a grain of cocaine was given. A few days after the operation the patient developed acute pneumonia, otherwise he made a good recovery. He had no pain or inconvenience during the operation.

CASE 6. *Varicose veins of the lower extremities.*—The patient was a man, aged 30 years. Operation was performed on Feb. 5th, 1901. Intra-spinal injection of one-third of a grain of cocaine was given. During the early part of the operation the patient complained of a little pain; but after a slight nausea this was unnoticed. Portions of the veins of the right lower extremity were dissected out. The operation was inconvenienced by clonic spasm which affected the muscles of both thighs. Two hours after the operation the patient was insensible to pain in the lower extremities and was numb as high as the fourth costal cartilage. He did not feel the pain but only the pressure of the prick of a needle in this area. The skin could be pinched tightly, while pressure on the testicles was painless. Sensation to cold existed. Five or six hours after the operation the patient complained of aching in the small of the back. Clonic spasms in the thigh muscles were also present; these gradually passed off. On Feb. 14th the left internal saphenous vein was ligatured under an intra-spinal injection of one-third of a grain of cocaine. The patient had no pain and made a good recovery.

CASE 7. *Varicose veins of the lower extremity; excision.*—The patient was a woman, aged 28 years. Operation was performed on Feb. 11th, 1901. Intra-spinal injection of one-third of a grain of cocaine was given at 10.39 A.M. At 10.46 operation was commenced. There was no sign from the patient. At 10.50 the face and hands sweated profusely, there was retching, and the pulse was 60, regular and full. At 10.52 the pulse was 62, regular and full. At 10.53 the sweating had considerably diminished. The patient retched at intervals. At 10.55 the pulse was 70 and the patient drank a little water. At 10.57 the pulse was 100, not quite as full. At 10.58 the pulse was 84. The feeling of sickness was much relieved by water. Throughout the operation the patient constantly declared that although she felt something there was absolutely no pain. At 11.0 the operation was finished. The pulse was 84, regular, and the fulness was increasing. There was slight sweating, but the mucous membranes and finger-nails had remained of a good colour throughout. The patient was smiling and quite cheerful. At 11.2 the skin was quite dry. The pulse was 76 and full. The patient had her meals as usual after operation. She suffered from headache in the afternoon after the operation, also for two or three days following. She made a good recovery.

CASE 8. *Radical cure of femoral hernia.*—The patient was a woman, aged 36 years. Operation was performed on Feb. 11th, 1901. Intra-spinal injection of one-third of a grain of cocaine was given. The operation was commenced seven and a half minutes after the injection and was completed at the end of 25 minutes. The patient had entire loss of sensation of pain and seemed hardly conscious of pressure or weight. She perspired freely and felt very hot. The pulse at the commencement was 96 per minute and varied between 100 and 110 during the operation. The patient neither vomited nor felt sick and had no sensations of tingling either before or after operation. She had a drink of water during the operation. She made a good recovery.

CASE 9. *Radical cure of double inguinal hernia; Bassini's operation.*—The patient was a man, aged 44 years. Operation was performed on Feb. 11th, 1901 (left side). Intra-spinal injection of one-third of a grain of cocaine was given. This patient asked to be operated on under cocaine, as his experience of ether was unsatisfactory, and the patients in

the two beds on his left had been operated on by this method. The patient had no pain during the operation but was sensitive to pressure. On the 25th the right side was operated on. One-third of a grain of cocaine was injected as before. The injection was not as successful as on the former occasion. The patient felt pressure as he did on the left side and he had painful sensations when the needle was used for stitching, though the primary skin incision did not apparently trouble him at all. He made a good recovery.

CASE 10. *Senile gangrene of the foot; Stokes's amputation.*—The patient was a man, aged 61 years. Operation was performed on April 25th, 1901. Intra-spinal injection of one-third of a grain of cocaine was given. This was not very successful, probably because the cocaine had been twice sterilised and the needle was not washed out with salt solution, so that the patient might not have had the full dose. He was a very nervous man and appeared to feel acutely some parts of the operation. It was difficult to estimate how much he really felt. His pulse was 140 throughout. He had no sickness. He made a good recovery.

CASE 11. *Gangrene of the leg.*—This case was operated on by Mr. Ward. The patient was a woman, aged 43 years. Operation was performed on Feb. 20th, 1901. Intra-spinal injection of one-third of a grain of cocaine was given. In 10 minutes there was complete analgesia in both lower extremities. Amputation was done through the middle of the thigh. After the operation 10 minims of liquor strychniæ were given hypodermically. The patient vomited after the operation. The parts remained analgesic for about two hours. The patient made a good recovery.

Leeds.

LEUCOCYTE ENUMERATION FOR ROUTINE WORK.

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THE estimation of the number of leucocytes in the blood is acknowledged to be of great value and should be practised more frequently as a routine method of examination. It will probably be admitted, however, that it is by no means as frequently, and as an every-day practice, carried out as its value warrants. This, I think, is largely due to the extra time and trouble involved in making a separate leucocyte count and to the considerably larger amount of blood required. The method of enumeration advocated by most authorities is by means of the Thoma-Zeiss apparatus, using the large special pipette provided for that purpose. A diluting solution, such as very dilute acetic acid, is used to lacerate the red corpuscles. Such a method necessitates a collection of the blood and an enumeration quite separate from that for the red corpuscles. A distinctly larger quantity of blood is also required, and this in many cases is not obtained without considerable difficulty when it is remembered that pressure and other aids to blood-flow must be avoided. Patients, particularly in private practice, object to the deep puncture required.

The object of this brief note is to call attention to the value of the method advocated by Stengel¹ and to give a convenient mathematical formula for the enumeration. In his article Stengel explains how the calculation can be made but does not give a convenient formula which is always available. The method is slightly less accurate than if a separate dilution of 1 in 10 is made, but is sufficiently accurate for routine work, and with a formula to save calculation the extra enumeration of the leucocytes occupies only a few minutes. One collection only of blood is required, the red and white corpuscles being counted in the same preparation, and only one pipette has subsequently to be cleaned; in this way a considerable amount of time is saved. It has the advantage that if the white corpuscles are very numerous they can be counted on the squares in the same way as for red corpuscles. Professor C. S. Sherrington has also pointed out the importance of counting both red and white corpuscles in the same blood preparation.

In brief the method is as follows. Use a Thoma-Zeiss small pipette—i.e., the one ordinarily used for red corpuscles

—and collect the blood exactly as for the enumeration of red corpuscles except that the blood should always be collected up to the 1.0 mark and the dilution should be made with some coloured fluid such as Toisson's solution² or Sherrington's fluid. The red corpuscles are first counted in the ordinary way. To count the leucocytes, draw out the eyepiece until a diameter of the field of vision is just spanned by an exact number of squares. Call this number x —i.e., x = the number of squares which exactly stretch across a diameter of the field of vision. The ruled squares need now no longer be taken into account but only the fields of vision. Count the number of leucocytes in any recorded number of fields of vision, taking care that the fields do not in any way overlap. The stained leucocytes can be readily distinguished from the red corpuscles. Divide the number of leucocytes by the number of fields of vision counted to obtain the average number per field of vision. Let this = y —i.e., y = the average number of leucocytes per field of vision. The larger the number of fields of vision counted the better. Then, with the blood diluted 100 times, as recommended, the number of leucocytes per cubic millimetre = $\frac{5,600,000 y}{11 x^2}$.

x and y only have to be determined and a simple calculation gives the result. Such a formula is available for any microscope and for any eyepiece, &c.

A note on how the formula is obtained is appended.

x = the number of sides of squares to go across the field of vision. Each square is $\frac{1}{20}$ millimetre. $\therefore$ the dia-

meter of the field of vision is $\frac{x}{20}$ millimetre, and the

radius (r) of the field of vision = $\frac{x}{40}$ millimetre. The

area of any circle = πr^2 , and $\therefore$ the area of the field of vision = πr^2 . $\pi = \frac{22}{7}$ (near enough for practical purposes) $\therefore$ the area of the field of vision in question

= $\frac{22}{7} \times \left(\frac{x}{40}\right)^2$. The depth of blood in the counting

cell is $\frac{1}{10}$ millimetre; $\therefore$ the cubic capacity of the field of

vision = $\left(\frac{22}{7} \times \left(\frac{x}{40}\right)^2 \times \frac{1}{10}\right)$ cubic millimetre. y =

the average number of leucocytes per field of vision—i.e., in 1 field of vision = y leucocytes; $\therefore$ in $\frac{22}{7} \times \left(\frac{x}{40}\right)^2$

$\times \frac{1}{10}$ cubic millimetre = y leucocytes; and $\therefore$ in 1

cubic millimetre $\frac{7 \times 40 \times 40 \times 10 \times y}{22 \times x^2}$ leucocytes =

$\frac{56,000 y}{11 x^2}$. (This is in the diluted blood.) The blood is

diluted 100 times, $\therefore$ in 1 cubic millimetre of the undiluted blood = $\frac{56,000 y \times 100}{11 x^2}$ leucocytes = $\frac{5,600,000 y}{11 x^2}$.

Cardiff.

BUPHTHALMOS, OR CONGENITAL HYDROPHthalmOS.¹

BY GEORGE WHERRY, M.C. CANTAB., F.R.C.S.

THREE cases of buphthalmos, or congenital hydrophthalmos, are here remarked upon.

CASE 1.—In this case the patient was an infant with very large and nebulous corneæ and rather blue sclerotics. The pupil of one eye could just be seen. The cornea measured across from 13 to 14 millimetres in each eye, but there was no conicity or local bulging.

CASE 2.—The patient was a girl, aged 14 years, with large nebulous corneæ 15 millimetres in diameter and with

² Toisson's solution consists of methyl violet, 0.025 gramme; chloride of sodium, one gramme; sulphate of sodium, eight grammes; glycerine, 30 grammes; and distilled water, 160 cubic centimetres. The solution does not keep well. It must be quite clear and should be filtered just before use.

¹ A paper read before the Cambridge Medical Society.

¹ Diseases of the Blood, Twentieth Century Practice of Medicine, vol. vii.