

the opening thus made the interior of the larynx can be inspected and the nature and extent of the growth seen. With strong cutting forceps the growth, with a sufficient margin of healthy tissue, is now cut away, together with the overlying cartilage in one piece. The taking away of the cartilage together with the underlying soft parts ensures not only a more thorough removal of the growth, but gives a much better view of the parts which are being divided, and much freer access for the use of instruments in the interior of the larynx.

The thyrotomy is not always necessary. When it is known that the growth is malignant and that it is limited to one vocal cord there is no need to split the thyroid. With a small saw the thyroid cartilage is divided in the median line from its lower edge upwards nearly to the upper margin. A transverse incision is then carried backwards just below the upper edge of the thyroid, nearly to the posterior border, and then downwards just in front of the posterior border. The square piece of cartilage thus marked out is removed, and subsequently the larynx is opened by dividing the underlying soft parts.

The following advantages were claimed for the operation.

1. It ensures more thorough removal of the disease by giving a free view of the parts to be removed, as well as by taking away the overlying cartilage.

2. The operation is rapid and easy.

3. Bleeding is easily controlled and the great danger of the operation—blood entering the air-passages and causing difficulty with the anæsthetic and subsequently septic pneumonia—is avoided.

4. After the operation the patient is able to swallow without difficulty or pain, which is not always the case with thyrotomy when there has been much wrenching apart of the cartilages.

5. Healing is rapid, and there is no subsequent necrosis of a fragment of cartilage, such as occasionally follows an ordinary thyrotomy.

6. The after-results as regards the voice are excellent and there seems no danger of subsequent laryngeal stenosis.

The advantages of this method, and more especially that of being able to see plainly the parts which are being divided and thus of being able to arrest immediately every bleeding point, have led me to simplify the operation. As all hæmorrhage can be immediately arrested the preliminary tracheotomy is obviously a useless and unnecessary complication. Being able to dispense with tracheotomy the usual vertical incision down the front of the neck can be replaced by a curved transverse incision. The advantages of the transverse incision, both with regard to rapidity of healing and the subsequent cosmetic effect, need hardly be mentioned. The transverse incision gives a better view of the parts to be removed and heals with hardly any scarring or puckering. Also, it is more superficial and less extensive, and the deeper tissues in the lower part of the neck are not opened up. Thus there is less risk of sepsis, and healing is more rapid.

This operation I recently carried out in the case of a feeble man, aged 72, with epithelioma of the right vocal cord. The man was suffering from general atheroma and cardiac degeneration, as well as from chronic emphysema and bronchitis. He was therefore a bad subject for a prolonged anæsthetic and especially for an operation upon the air-passages. It was essential that the operation should be performed quickly, that no blood or fluid should enter the windpipe during the operation, and that there should be no trouble in swallowing subsequently. Naturally also the smaller and the more superficial the wound and the quicker the healing, the more likely he was to survive. Under chloroform anæsthesia a curved horizontal incision was carried across the front of the larynx at the level of the crico-thyroid membrane. The tissues being divided down to the larynx the crico-thyroid membrane, the upper edge of the cricoid ring, and the right half of the thyroid cartilage were freely exposed. With a small saw the thyroid cartilage was divided in the median line from its lower edge nearly to the notch in its upper border. A cut almost at right angles to this was carried backwards just below the upper edge of the thyroid cartilage, and then another vertical incision was made near the posterior edge of the cartilage, so as to mark out a square of cartilage and leaving intact both the posterior and upper borders of the thyroid. The piece of cartilage thus

marked out was detached from the soft parts underlying it with a blunt dissector and removed. All bleeding being arrested the interior of the larynx was carefully opened in the median line through the crico-thyroid membrane and upwards along the course of the first incision in the cartilage above described. Then an incision was carried backwards along the lower border of the crico-thyroid membrane as close to the cricoid ring as possible, and the edges of the triangular flap thus marked out being retracted the interior of the larynx and the growth could plainly be seen. The growth, with a sufficient margin of surrounding healthy tissue, was now detached on a third side by a horizontal incision carried well above it, and finally dissected posteriorly off the arytenoid cartilage. All this cutting was carried out piece by piece and every bleeding point being picked up at once, the growth was removed without a drop of blood entering the air-passages. The operation up to this point occupied barely 35 minutes. Some time was now spent in allowing the wound to become "glazed" by exposure to the air and letting the patient come almost out of the anæsthetic, so that no possible source of subsequent bleeding should be left. When the wound was quite dry the edges of the skin were brought together by two stitches, except for a small gap at its centre which was left open for drainage. A simple dressing was applied and the patient returned to bed. He made an uninterrupted recovery without any complications. He was in a very feeble condition, and I feel sure that he could not have stood a severe operation or even a prolonged anæsthetic.

This operation is both safer and more thorough than the ordinary thyrotomy. It is safer because (1) it is simpler and therefore more rapidly performed; (2) it allows free access to the field of operation and therefore complete facility for dealing with hæmorrhage; (3) the smaller and more superficial wound entails less danger of sepsis; (4) the transverse incision heals more quickly; and (5) tracheotomy is quite unnecessary and is therefore omitted. It is more thorough because (1) it allows a good view of the parts to be removed; and (2) the overlying cartilage is also removed. These advantages are obtained without any corresponding risks or disadvantages. I believe, therefore, that it will be the method of choice in the future, and that thyrotomy, except as a purely exploratory operation, will no longer be practised.

Devonshire-place, W.

THE ORIGIN AND PREVENTION OF CEREBRO-SPINAL FEVER.

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It may be that if the causes and prevention of cerebro-spinal fever had been less simple they would have been more generally accepted by the profession to-day.

The Specific Organism.

The diplococcus intracellularis meningitidis of Weichselbaum conforms to Koch's law for pathogenic organisms. Constantly found in the tissues and body fluids of the victims of epidemic cerebro-spinal meningitis, the meningococcus may be isolated in pure culture, is able to reproduce the disease in monkeys, can be recovered from the lesions in these animals, and is therefore the causal organism of cerebro-spinal fever.

Apart from the monkey, man is the only animal in whose nervous system specific lesions are produced by this organism. Starting, then, with the proved proposition that the meningococcus is the sole cause of cerebro-spinal fever, it is possible to show, with the exactness of a problem in Euclid, the means whereby man is infected, the conditions under which he develops the malady, and the method of preventing both infection and disease.

Conditions Determining the Spread of Infection.

At times when the disease is not prevalent meningococci have been found in the throats of 2 per cent of healthy soldiers.¹ Among healthy naval ratings, not known to have

¹ Brit. Med. Jour., 1915, vol. i., p. 466.

been exposed to infection, I found meningococci in the throats of two individuals out of a hundred examined. The organism has recently been found in a larger proportion of the civil population not exposed to infection.²

It is evident that meningococci may exist as harmless saprophytes in the throats of healthy persons. These people may or may not develop the disease, and they may or may not spread the infection to others. If they do transmit the meningococcus to other people, it is obvious that the number of persons amongst whom the disease may arise will be increased. The conditions which determine whether or not infection is spread are as follows. Any organism in the naso-pharynx may be expelled from the mouth during the act of coughing in small droplets of secretion which float in the air for from half an hour to four hours, according to the density and humidity of the atmosphere. This would easily explain the method of infection provided the temperature of the air was above 22° C., but on the other hand, meningococci soon perish at lower temperatures. Now 22° C. corresponds to 71.6° F., and I found that meningococci die in 30 minutes when exposed to a temperature of 60° F., while lower temperatures are more rapidly fatal.³ It is therefore clear that air-borne meningococcal infection can only occur in a warm atmosphere, and is impossible in cold air.

Epidemics of cerebro-spinal fever usually begin in January or February, and disappear with the advent of May. But January and February are the two coldest months of the year, as is proved by daily readings for many years of the temperature in the watermains at Chelsea. The temperature of water follows the mean air temperature, and in these months the lowest readings of 37° to 40° F. are obtained.⁴ The paradox of a disease which appears during cold weather, but whose specific cause is destroyed by cold air and can only be carried by warm air, is explained by the fact that cold wet weather leads to shutting off the natural means of ventilation, and that the air indoors becomes warm and saturated. Under these conditions air-borne meningococcal infection is carried from one person to another. Overcrowding was long regarded as predisposing to the malady, but in my original communication⁵ I showed that warm saturated air is the *actual cause* not only of the spread of infection but also of the incidence of the disease. An objection to this theory might be raised in the query, Why does not infection spread in the summer months when the air is warm? The air in summer is less saturated than in winter, droplets of secretion are dried up more rapidly, and meningococci offer no resistance to drying. Lastly, even if infection were spread in summer, the essential condition which determines the secondary invasion of the tissues would be absent.

Epidemics of cerebro-spinal fever have occurred among native races in tropical countries, and this is in favour of my explanation. In the West African jungle I found natives in ill-ventilated huts where the atmosphere at night must have been as saturated and warm from the breathing bodies of the occupants as the moist air from the swamps outside. In such a climate the only factor that would limit the spread of infection is the burning sun by day.

Conditions which Determine Secondary Invasion of the Tissues.

When warm saturated air is inhaled the nasal mucosa becomes swollen, congested, and covered with thick secretion, the activity of the ciliated cells is reduced, and phagocytic action in the lymphoid tissues is diminished.⁶ This means a lowered local resistance to any bacterial infection which may be present in the naso-pharynx. Now bacteria are only saprophytic by virtue of the superior resistance of the tissues and if the resistance be lowered the bacteria become pathogenic. Warm saturated air enables meningococci to be carried to the naso-pharynx, creates there a local condition favourable to the growth of the parasite, and reduces the phagocytic properties of the lymphoid tissue, so that the organism is able to pass the first line of defence, enter the lymphatic system, and find its way *via* the

blood stream to the central nervous system, on which either cold or over-fatigue have acted as predisposing influences. Furthermore, warm saturated air favours the incidence of all air-borne infections. Thus on Feb. 5th, 1916, between the hours of midnight and 2 A.M., and between 4 A.M. and 5 A.M., I visited barrack-rooms in which over 2000 men were sleeping. One example of the conditions which prevailed will suffice. Room E3 was occupied by 16 men, which allowed 670 cubic feet per man. Of 12 windows only one was slightly open at the top. The air was hot, close, nauseating, and oppressive, while the moisture of condensation was streaming down the windows. I contend that the amount of cubic space per man is not a safe guide to the efficiency or deficiency of ventilation, which must be judged on common-sense data.

Now the case incidence of certain respiratory diseases due to air-borne infection in the above barracks was as follows for the six weeks ending Feb. 5th, 1916:—

| Week ending— | Catarrh. | Tonsillitis. | Sore-throat. | Total strength. | Case incidence. |
|---------------|----------|--------------|--------------|-----------------|-----------------|
| Jan. 1st ... | 14 ... | 2 ... | 0 ... | 2112 ... | 7.5 per 1000. |
| Jan. 8th ... | 5 ... | 3 ... | 0 ... | 2067 ... | 3.8 " |
| Jan. 15th ... | 6 ... | 0 ... | 7 ... | 2091 ... | 6.2 " |
| Jan. 22nd ... | 23 ... | 2 ... | 3 ... | 2125 ... | 13.1 " |
| Jan. 29th ... | 18 ... | 6 ... | 4 ... | 2128 ... | 13.1 " |
| Feb. 5th ... | 60 ... | 10 ... | 10 ... | 2155 ... | 37.1 " |

The rise in diseases due to air-borne infection is very apparent during the last week, and in that week two cases of cerebro-spinal fever appeared.

Prevention.

Once cerebro-spinal fever has appeared in any community, bacteriological examination of the contacts discovers the number of infected persons. These are regarded as potential cases of the disease, and the development of the malady among such people can sometimes, but not always,⁷ be prevented by the local application of antiseptic sprays or vapours to their throats. This treatment, if efficient, also prevents the further spread of infection, but of necessity it has a very limited application. It is no more practicable to free the throats of the entire population from meningococci than it would be to attack the widespread distribution of the pneumococcus as a saprophyte in the throats of healthy people.

To control the spread of infection once it has arisen is wise, but it would be infinitely wiser to prevent the possibility of infection in the first instance. The means of prevention are simple. All windows must be open day and night, and to prevent the necessity for closing them in rain or in wind, a weather-board of 18 inches in depth is fixed inside the lower part of the window at an angle of 45°, so that the lower sash may be screwed up one foot from the bottom. A night patrol may be required to see that the space between the window and the weather-board is not covered over with clothes to keep out the air. In the barracks to which I have referred these alterations were carried out at a cost of £200. No further cases of cerebro-spinal fever appeared, and the incidence of respiratory diseases showed a remarkable fall. These simple measures soon save their cost in preventing the possibility either of infection or disease, in obviating the necessity for an enormous amount of expert bacteriological work, in diminishing the incidence of all affections of the respiratory system, and in raising the general health of those to whom they are applied.

If these statements are tested on a large scale by the authorities during the coming winter there will be no cases of cerebro-spinal fever in the Services. There would be nothing very remarkable in such a fortunate result, for the power whose aid is here invoked is the *Vis Medicatrix Naturæ*.

⁷ C. H. Whiteside: Journ. of the R.N. Med. Service, vol. i., No. 3, p. 251.

² B. M. J., 1916, vol. ii., p. 228.

³ THE LANCET, 1915, vol. ii., p. 862.

⁴ Parkes and Kenwood: Hygiene and Public Health, fifth edition, p. 43

⁵ THE LANCET, 1915, vol. ii., p. 862.

⁶ Leonard Hill and F. F. Muecke: THE LANCET, May 10th, 1913, p. 1291.

Temporary Lieutenant-Colonel H. R. Kenwood, R.A.M.C., professor of hygiene and public health in the University of London, will deliver a public lecture at University College, London, on "Hygiene: Some Lessons of the War," on Friday next, Nov. 17th, at 5.30 P.M. The chair will be taken by Surgeon-General Sir Alfred Keogh, Director-General, Army Medical Service. The lecture is open to the public without fee or ticket.

Medical Societies.

ROYAL SOCIETY OF MEDICINE.

SECTION OF OPHTHALMOLOGY.

Inaugural Address.—Exhibition of Cases.—Photography of Macroscopic and Microscopic Eye Specimens.—Bilateral Glioma of the Retina.—Recurrent Glioma of the Retina.

A MEETING of this section was held on Nov. 1st, Mr. WILLIAM LANG, the President, being in the chair.

In his inaugural address, the PRESIDENT advocated the appointment of a small committee to initiate and organise research and, perhaps, a bureau for collecting particulars of rare cases. In this way a quantity of valuable material would be available for research scholars, or for a committee appointed to make use of it. Further, a card-index system for the recording of all literature bearing on the science of ophthalmology in the United Kingdom would be very valuable. At present pathological confirmation of the findings of clinical observation on an adequate scale was lacking, especially in regard to septic foci as the cause of many eye diseases. With the society's excellent laboratory it only needed a system of subsidised workers. This could well be the occasion for joining with other bodies in a crusade to instruct the nation in the cultivation of right habits, notably in regard to clean mouths. The same purpose pervaded all: to decrease by British effort the power of every disease.

Mr. G. WINFIELD ROLL showed a case of Congenital Pigmentation of the Optic Disc. The patient was the subject of glycosuria, and the right eye was affected with retinitis. The vessels in the remainder of the fundus were normal.

Dr. F. E. BATTEN showed a child with Pigmented Degeneration of the Retina associated with epileptic fits. The sight had failed somewhat rapidly during the last year, and a central scotoma in both eyes had been demonstrated, somewhat to the temporal side. There was also optic atrophy and some pigmentary disturbance at or near the macula. Physical examination of the nervous system was negative. The father was syphilitic, but this patient showed no trace of that disease.—The case was discussed by Mr. PATON, Mr. R. D. BATTEN, Captain A. W. ORMOND, Mr. MAYOU, Mr. HERBERT PARSONS, and the PRESIDENT.

Mr. NORMAN B. B. FLEMING showed a case of Retinitis Circinata, with changes in blood-vessels.

Mr. A. C. HUDSON exhibited a new small Speculum.

Lieutenant-Colonel R. H. ELLIOT and Mrs. ELLIOT communicated a paper on the Photography of Macroscopic and Microscopic Eye Specimens. The object of the paper was to help those who desired to photograph macroscopic eye preparations, there being no available literature on the subject. The following points were regarded as of importance: 1. The photograph must be taken in water, without the intervention of glass or other similar material. 2. The source of light must be good and even. 3. The camera must be placed vertically above the object so as to avoid reflections. 4. The object of the photograph must be so placed that its image will occupy the centre of the plate, and a method of adjustment should be available to secure this end with a minimum of inconvenience. 5. A simple arrangement is necessary to fix the eye in position during the whole period of exposure. 6. To save unnecessary retouching the object should be photographed lying on a dark and uniform surface to obviate the background disturbing the attention of those viewing the picture. 7. Care should be exercised in the choice of a camera and exposure periods must be carefully studied. For the making of lantern-slides the contact method was recommended, and attention was directed to the following points: correct exposure; the preparation of plates for exposure; development and fixation of the slides; the drying of the plates; and the reduction, intensification, and varnishing of slides.

Dr. FRANK E. TAYLOR and Mr. FLEMING contributed a paper on a case of Bilateral Glioma of the Retina with Multiple Metastases. The patient was a female child aged 3 years, in whom an abnormality was noticed in the left eye 18 months previously. On admission to hospital there was a fungating growth protruding between the lids of the left eye, keeping them separate. The mass was bathed with a

thin, semi-purulent discharge. The right eye was much enlarged, and apparently proptosed, the iris fully dilated, and stretched into a thin band at the limbus, the lens being in contact with the posterior aspect of the cornea. The growth was of lemon colour. No reflex was obtainable ophthalmoscopically. Mr. Elmore W. Brewerton (with whose permission the case was recorded) operated at once, performing exenteration of the orbit, with partial removal of the lids, afterwards suturing the wound. The right eye was very freely excised. The optic nerve was found to be involved, being surrounded by growth for half an inch behind the eye. A fortnight after discharge from hospital there was a recurrence, half the size of a tennis ball, from which the patient died. She had shown but little evidence of suffering pain. Microscopically the growths were found to be composed of closely-packed small round cells, with large deeply-staining nuclei. A few spindle cells were also present. The body was much emaciated, and the metastases were extensively distributed. The subject was discussed from a general standpoint.

Mr. ARNOLD LAWSON read notes on a case of Recurrent Glioma of the Retina. The patient was a boy aged 3½ years, and the gliomatous eye was removed. It had almost perforated the globe. Mr. R. A. Greeves found a large scleral staphyloma at the front, and it was infiltrated with glioma cells, while masses of growth could be traced along the sheath of the foramen. After the patient had remained well for six months there was a recurrence in the orbital cellular tissues, and evisceration was carried out at hospital. There was a further recurrence, and 90 mgm. of radium were applied for four and a half hours. Free sloughing followed, and the child was kept in hospital for six and a half weeks, at the end of which time there seemed to be no sign of growth. Three months later, however, the patient was readmitted on account of a fluctuating swelling; it yielded pus, at the bottom of which was suspicious pultaceous material. Investigation revealed an extensive recurrence, beyond the reach of either further operation or radium. The child appeared to have a remarkable absence of pain, and seemed fairly comfortable except towards the end.—This paper and the preceding one were discussed by Mr. W. C. ROCKLIFFE, Mr. BREWERTON, Mr. PARSONS, Mr. HOLMES SPICER, Lieut.-Colonel ELLIOT, and Mr. TREACHER COLLINS, the last named calling attention to the different methods of spread of glioma and sarcoma of the orbit: one began in the neural epiblast and the other in the mesoblastic tissue. Sarcoma of the choroid generally spread by metastases, whereas gliomatous growths spread by continuity, and death occurred from local recurrences, as was shown in a number of cases traced by Mr. J. B. Lawford and himself. Lieut.-Colonel Elliot agreed with Mr. Brewerton's operative procedures, speaking from his experience of a number of such cases in India.

HARVEIAN SOCIETY OF LONDON.—A meeting of this society was held on Nov. 2nd, Dr. Edmund Cautley, the President, being in the chair.—A paper entitled "Warfare on the Brain" was read by Dr. E. Farquhar Buzzard, dealing chiefly with the subjects of shell shock and, secondly, traumatic epilepsy. Dr. Buzzard said that shell shock, a much-abused and unfortunate term, covered (a) cases of pure exhaustion; (b) cases in which exhaustion had excited inherited neuropathic and psychopathic tendencies into activity; (c) "martial misfits" passing as normal individuals in civil life but unable to bear the strain of military service; (d) normal individuals affected by close shell explosion and showing symptoms similar to those following a blow on the head. Care must be taken to exclude the presence of organic changes in the skull or brain; such a symptom as mutism is hysterical and signifies mental disorder and not a localised cerebral injury. In the first three groups direct exposure to shell explosion might be absent, he said, or at most was merely a culminating factor in the production of symptoms. The principle underlying surgical interference was, Dr. Buzzard said, not to cure the epilepsy but to restore the injured part of the brain as far as possible towards the normal; where operation would have the opposite effect it was contra-indicated. The treatment of the epilepsy itself was medical, and the prophylactic use of bromide in cases of head injury of great importance. The problem of the treatment of the large numbers of these cases occurring at the present time would, he said, be of national importance.—An interesting discussion followed Dr. Buzzard's paper.