tected. Moreover, these movements cause any vitreous opacities to be shaken up and to float through the field of vision. Next as to the refraction; if there is a high degree of myopia or hypermetropia, this condition may be readily detected by the fact that we can see the details of the fundus—e.g., the retinal vessels, at some distance in the erect image. For instance, if, in a case of high myopia, we regard one of the retinal vessels on the disc or retina, and move our head slightly to one side, we notice that the image moves in the contrary direction; if we move to the right, it moves to the left, and *vice versa*; so that we obtain a reverse image of the fundus. In hypermetropia, on the other hand, just the opposite occurs, for the image moves in the same direction as the observer. In emmetropia we do not with the direct method gain any image of the fundus at some distance, which is in part due to the great diminution of the visual field, but chiefly to the rapidly increasing enlargement of the object when the eye is examined at a distance, which is so great that in the area of the field no single vessel can be seen sharply defined, but only appears as a red reflection in the pupil. Mr. Couper has lately shown that with a weak concave mirror (of thirty inches focus) cases of mixed astigmatism may be easily diagnosed in the erect image; in such cases an inverted or erect image becomes alternately visible according as the observer views the fundus through the meridian of the greatest or the least curvature. The state of refraction may also be diagnosed in the reverse image. In the *emmetropic* eye the reversed enlarged image of its fundus is formed in front of the object lens, and at its focal distance. In *hypermetropia* the emerging rays are divergent, and hence the image is formed further off than the focal distance, and is consequently larger than in emmetropia. In *myopia* the emerging rays are convergent; the image is therefore formed nearer than the focal distance, and is consequently smaller. Mr. Hutchinson has, moreover, pointed out that the existence of hypermetropia or myopia may also be recognised in the reverse image, by observing whether the size of the disc undergoes any change when the object lens is removed further from the eye; for in hypermetropia it diminishes and in myopia it increases in size as the lens is removed to a greater distance.

I cannot too strongly impress upon beginners the importance of closely and minutely examining a great number of healthy eyes, so that they may become thoroughly conversant with the physiological appearances of the fundus, and the numerous peculiarities that may occur within normal limits. To those who have not the opportunity of examining many human eyes, I would recommend the use of Perrin's artificial eye.* (Fig. 4.) It consists of a brass artificial eye (E), fitted in front with a plano-convex lens (L),

FIG. 4.

in the situation of the cornea. This lens is covered with a black metal cap, having a central aperture corresponding to the pupil. There are two of these caps: the one has a very small central aperture, which corresponds to the normal size of the pupil; the other a larger opening, like a

widely-dilated pupil. There are, also, three lenses of different refracting power, thus enabling us to convert the eye into a hypermetropic, myopic, or astigmatic one. The posterior half of the eye opens, so as to admit of the insertion of a papier-maché cup or disc (D'), coloured so as to represent the appearances of the healthy fundus, or of some pathological condition. There is a series of these coloured discs, illustrating many of the morbid ophthalmoscopic changes of the fundus.

CLINICAL NOTES

ON THE RELIEF OF NOCTURNAL DYSPNŒA ARISING FROM DISEASE OF THE HEART.

BY S. O. HABERSHON, M.D.,
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BREATHLESSNESS and palpitation are two of the most prominent signs of disease of the heart; and they are so for this obvious reason, that respiration can only be properly maintained when the equilibrium of healthy action between the lungs and the heart persists. Any disorder in the mechanism of the heart may cause difficulty in breathing. The general indications of the numerous diseases of the heart are sufficiently distinctive; but whilst some disorders are due to the state of the nerves of the heart, others are traceable to the altered composition of the blood; some organic affections are caused by an abnormal condition of the muscular fibre of the heart and its vessels, others to morbid change in its valves or in the size of its cavities. In all these maladies shortness of breath is a symptom, and this breathlessness and gasping dyspnœa are especially distressing from the paroxysms which occur during the hours of the night.

The medical attendant is rendered too familiar with such expressions as the following: "I have to sit up for hours at night"; "as soon as I lie down the difficulty comes on"; "I should do very well if I could get a night's rest"; "I have not had a night's rest for weeks." The desire is most urgent for immediate relief, if that is by any means attainable. In numerous instances the cause of the cardiac affection can be removed, and that is the best mode of mitigating the distressing symptom; but in many organic diseases, where the cause cannot be removed, the exhaustion from want of rest aggravates the primary malady, and hastens the fatal issue. The instances of cardiac dyspnœa may be grouped into three classes, and the means of affording relief will to some extent vary in each division.

In the first class are cases of *failing power of the heart's action from loss of blood, and from sudden shocks to the nervous system*. In these cases the action is feeble and often irregular, the pulse quick and irritable; the patient starts from sleep alarmed and terrified, and is sometimes afraid to sleep on that account. The first sound of the heart is short and indistinct. The best treatment consists in the administration of nourishment, in the proper use of stimulants, as ether, ammonia, and the less diffusible ones of wine and ardent spirits, and afterwards in the employment of the preparations of steel, &c. If this condition be associated with sleeplessness or pain, then narcotics, as opium, hydrate of chloral, the spirit of chloroform, &c., will be resorted to with advantage. Although opium interferes with the secretions, and produces constipation, still its stimulant effect renders it additionally valuable in exhaustion.

In a second class the cardiac disease consists in *imperfection of the mitral valve*, with or without dilatation of the left ventricle. This condition is shown by abnormal sounds in the plane of the mitral valve, by small and irregular or intermittent pulse, by hæmorrhage from or congestion of the lungs, by enlargement of the liver, by congestion of the kidneys with scanty and often albuminous urine, by flatulent distension of the stomach, by anasarca of the lower extremities, and by ascites. The nocturnal dyspnœa is often most distressing, but it is relieved in a much less degree by stimulants and by narcotics than the former class of cases. The most effectual method of relieving the dyspnœa is by diminishing the tension on the right side of the heart, and

* This instrument may be obtained of Nachet, 17, Rue St. Severin, Paris.

the congestion of the lungs, liver, and kidneys, by small doses of mercurials, with squill and digitalis, by diuretics, as the nitrate, the bitartrate, the iodide and nitrate of potash, &c., and by gentle purgatives, especially such as induce free and watery action of the bowels. These remedies will afford more relief than opium, morphia, or ardent spirits; the benefit arising from the latter is very transient, and is often followed by increased distress.

In a third class of cases, we find the same symptom of nocturnal dyspnœa produced by *failing muscular power of the heart*, from degeneration of the muscular fibre, from an atheromatous condition of the vessels, from idiopathic anæmia, from disease of the aortic valves and dilatation. If there be congestion of the lungs and distension of the right side of the heart, the means just referred to may be employed with advantage; but we may find the most distressing paroxysms of breathlessness without any such congestion. Stimulating narcotics should be used, as the spirit of chloroform, camphor, senega, ammonia, and Indian hemp; opium and morphia may be given with great caution, and so also the hydrate of chloral. In all these forms of cardiac disease, nervous excitement should be avoided. The patient should abstain from muscular exertion, bronchial irritation, from exposure to cold and wet and from sudden changes of temperature, must be guarded against; and, if possible, congestive conditions of the liver and kidneys, constipation of the bowels, and flatulent distension of the stomach, should be prevented. The principal meals should be taken early in the day, when digestion is most active. Starchy food should be abstained from at night, and the temperature of the surface should be carefully maintained. But when all these things have been attended to, and rigidly carried out, the paroxysms of dyspnœa still distress the patient, and in organic diseases constitute the great burden of complaint. Can any extraneous help be afforded, and are drugs of any value in mitigating this condition? I would reply in the affirmative. But, first, what is the condition with which we have to contend? It is dyspnœa and cardiac distress from a disturbance of the equilibrium in the action of the heart and lungs. Both organs receive large supplies of the vaso-motor or sympathetic nerve. Those nerves which regulate the respiratory act are in close connexion with the centres in the brain and spinal cord; and, although independent of voluntary control, the respiration can be greatly assisted by supplemental muscles under the regulating power of the will. In disease there is *greater irritability* of these cardiac nerves; the equilibrium is *more* easily disturbed, and relief is afforded by quieting the irritability, whilst we do not diminish the sensibility of the respiratory centres. If the lungs become surcharged with blood, if the respiration be impeded, then the right side of the heart becomes more embarrassed, and distress and dyspnœa at once result. During sleep the assistance of voluntary muscles is withdrawn; and if the maintenance of this equilibrium absolutely requires voluntary assistance, then the patient is unable to sleep, or, if consciousness be lost, there is a sudden start or fright, followed by hurried breathing or gasping for breath. If we can render the heart independent of this supplemental action, the patient will have comfortable rest. We seek to attain to this condition by the help of medicines. The remedies I have adverted to are the following:—Morphia and opium, foxglove, conium, belladonna, Indian hemp, senega, camphor, alcohol, ether, chloroform, and the hydrate of chloral.

Opium and morphia.—In functional irritability of the heart, these are valuable remedies, but less so in organic diseases. The distress of the patient is often aggravated by them, and sometimes additional excitement is produced. The cardiac nerves are quieted, but the respiratory centres are narcotised; and if the patient sleeps, he awakes with increased distress. The secretions are checked, and the heart's action thereby embarrassed. In some instances, where the hypodermic injection of morphia has been used, patients have entreated that it might not be repeated. Very small doses of morphia, however, often prove efficacious in relieving excitement, although not administered in sufficiently large doses to produce profound sleep; large quantities of morphia always tend to increase the pulmonary congestion, and to depress the action of the heart.

Foxglove is a favourite remedy, and in some instances it is of great value. Its primary action appears to be that of a

stimulant to the heart, and afterwards that of a sedative. Its effect is manifested more upon the cardiac than upon the respiratory nerves, and hence it is a more serviceable medicine than opium. Foxglove acts best in cases of imperfection of the mitral, when there is much irregularity of the heart, and is advantageously given with squill and small doses of mercurials, or with diuretics, as the nitrate or citrate of potash. But whilst I have often witnessed great benefit from its use in quieting and in regulating the pulse, in relieving dyspnœa, and in acting on the kidneys, I confess that I always watch its free administration with fear, on account of the numerous instances of sudden and fatal syncope coincident with its employment in full doses. Foxglove may be given more freely when combined with steel, and it is certainly a most effective remedy in cardiac disease.

Conium and belladonna are of especial value in those cases where there is spasmodic contraction of the involuntary muscular fibre of the bronchi; that is, where bronchitis or bronchitic asthma is associated with heart disease. In simple cardiac dyspnœa they are uncertain, and only slightly palliative in their action.

Stimulants, in the form of alcohol, ether, chloroform, carbonate of ammonia, are helpful for a different reason; they directly stimulate the cardiac nerves, and the flagging muscular power is roused to fresh effort. But alcohol has the disadvantage, if given continuously, of producing hepatic congestion, and of interfering with the free elimination of effete products. Chloroform and ether have in many persons a secondary sedative effect on the heart, and afford only very temporary relief. The carbonate of ammonia in full doses is deserving of a fuller use than it has generally received. Ten or fifteen grains may be given with syrup, and whilst the primary stimulant effect on the vaso-motor nerve is beneficial, the secondary action on the skin and on the glands is also salutary. The aromatic spirit of ammonia is less energetic in its action, and may be given in full and repeated doses with the next remedy to which I have to allude—namely, camphor.

Camphor is a cardiac stimulant, but its action is transitory and somewhat uncertain. If there be much flatulent distension of the abdomen, it is certainly palliative; but in order to act with any power it must be given in fuller doses than the watery solution.

Senega is an old remedy as a stimulating expectorant, and it was a favourite one with my late esteemed colleague, Dr. Barlow, who often used it in disease of the aortic valves. I have often prescribed it with benefit in other affections of the heart. It seems to exert a stimulant action both upon the respiratory and cardiac nerves, and tends to lessen paroxysmal attacks of dyspnœa at night.

Indian hemp is another remedy which I have found very efficacious in promoting rest in cardiac diseases. The extract or tincture may be given alone or in combination, and although in this we have a medicine which exerts more marked influence upon the cerebrum, still its subsequent sedative action is more manifest upon the cardiac than upon the respiratory centres; and in this respect it is often more efficacious than opium. Both senega and Indian hemp deserve fuller trial than they have generally received in these instances, and I can testify to their beneficial effect in many cases.

The *hydrate of chloral* has been very extensively used as a hypnotic, and in numerous instances it induces calm and refreshing sleep, without any subsequent ill-effects; but where there is great dilatation of the heart, or much weakness of the muscular fibre from degeneration, its employment is not altogether free from danger. In a case of distressing sleeplessness from aortic disease, with imperfection of the valves, twenty grains of the hydrate of chloral produced speedy unconsciousness, which continued for nearly twenty-four hours; but, although so alarming for a time, no ultimate injurious effect could be ascribed to the medicine. In other cases, forty grains have failed to produce any sleep, and the patient has requested that the dose might not be repeated. Where there is much pulmonary congestion, I regard its action as still more hazardous; for whatever may be the primary effect of chloral, its secondary action seems to be that of a depressant, both upon the muscular fibre of the heart and upon the pneumogastric nerve; and, if no sleep is produced by it, the system becomes excited, the countenance flushed, the brain disturbed,

and we have the semi-intoxicating effects of alcohol, without the benefit of its stimulative action. But whilst stating this, I regard the hydrate of chloral as a most valuable addition to our list of medicines, although less serviceable in cardiac sleeplessness than where there is no organic disease of the heart or lungs. The hydrate of chloral will often act very admirably for once or twice, and then altogether fail in affording relief.

These remedies have been separately mentioned because one and another will be anxiously tried, but often tried in vain, in extreme cases of cardiac disease. The agonising distress of intense dyspnoea is most painful to witness; and although medical skill can do much to relieve disease of the heart, all the resources of our science are required even to palliate the symptoms where the injury arising from organic defect has produced such a state of embarrassment that the necessary mechanical action can scarcely be performed. As a rule, greater relief to cardiac dyspnoea is afforded by lessening the distension of the cavities of the heart, and thereby diminishing its embarrassment, than by urging it to increased mechanical effort by the repeated administration of direct stimulant.

Brook-street, Grosvenor-square, Feb. 1871.

ON SANITATION IN INDIA.

By C. MOREHEAD, M.D., F.R.C.P.

In my note on sanitation in India in THE LANCET of the 28th of January, I refrained, in order to economise space, from reproducing an argument which I had elsewhere published against the principle of locating European troops permanently, or for continued periods of two or three years, in the hill climates of India. But it has since been brought to my notice that, in consequence of my former writings not being readily accessible, the application of the argument to the circumstances of the 58th Regiment, in the hot season of 1869 at Allahabad, is not, at once, intelligible. As there is no question of greater importance to the health of the European army than the true principle of utilising the hill climates of India, I would now correct the omission in my former communication by the following extract from my letter of September 17th, 1861, to the Secretary of State for India.

"In organising a sanitary system for the British soldier in India, the truly practical aim is not to give him that state of constitution which he would have in his native country, for that is incompatible with the contingencies of military service in India. The object ought to be to maintain him in that condition which best fits him for the maximum of efficient service with the minimum sacrifice of health and life, by, as far as practicable, protecting him from continuous high temperature, malaria, and other various agencies which deteriorate health. This is to be effected by a careful selection of sites for cantonments, good construction of barracks, a systematised use of hill, coast, and healthy monsoon climates, with assiduous attention to the other various conditions which are now so well known to conduce to the maintenance of health. Therefore, to place permanently at such elevations as Ootacamund, on the Neilgherry hills, all the British troops in India, even if politically practicable, would not prove, in my judgment, the best method of fitting the European soldier for the maximum of efficient service with the minimum sacrifice of health and life. Doubtless, Europeans permanently residing in a hill climate such as Ootacamund would retain much of their native vigour, but they would not be efficient for the contingencies of military service in India. If suddenly called to the plains for service in the hot season, there would be a heavy sick list from seasoning fevers and biliary derangements, and a rapid loss of vigour and stamina would result. Then, the service over, and the men exhausted by heat, fatigue, and sickness, moved back to their hill cantonments, would be subject to much mortality and invaliding from these forms of disease, for which the cold and rainy seasons of hill climates are unsuitable. Were it possible to transport in a few hours troops from the camp at

Aldershot to the plain of the Ganges any time between March and November, use them for active service, and return them, broken in health, in a few hours from India to Aldershot any time between October and May, the result need not be told. It would be analogous in kind to that which may be anticipated from the permanent location of troops in such positions as Ootacamund and the interior Himalayas, and their rapid transfer any time between March and November, in the one instance to Malabar, the Concan, or Carnatic, and in the other to the plains of the Punjab or of the Ganges, with their return to their hill cantonments between September and April. In both these instances I have assumed the hill position to be above the force of the south-west monsoon, as at Ootacamund, or beyond it, as in the interior Himalayas; but should it be open to the force of the south-west monsoon, as at Mahableshwur, or on the sub-Himalayan hill ranges, then the unfavourable period for return to the hill stations would be between November and March, and again between the middle of June and the end of September."

The 58th Regiment arrived at Allahabad on Jan. 12th, and consisted of the right wing, which had been three years at the hill station, Darjeeling, of a draft recently from England, and of the left wing, which had been three years at Benares, in the plains. The season was unhealthy. The regiment suffered severely between March 22nd and August 14th from cholera, fever, dysentery, and apoplexy; but the wing from the hill station and the draft from England suffered twice as much as the wing from Benares. A consideration of the argument in the above quotation and of the facts of the 58th Regiment seems to justify the statement that the difficulty in explaining the greater sickness and mortality of the right wing and the draft from England is purely imaginary. For what is there in these results but an illustration of the law in the physiology of animal heat—that the capacity of generating it varies in relation to external temperature, and is effected gradually, not suddenly; and of the law in pathology, that constitutional conditions and predisposition are always leading factors in the quantity, type, and mortality of disease, whatever its exciting cause may be?

It may, however, chance that there is imperfect knowledge or inaccurate reasoning in these views which I have pressed on the Government of India in various ways and at different times during the last twelve years, and which have been more or less familiar to my own mind since 1834, when my practical acquaintance with the hill climates of India commenced. If so, it is time that the fallacy should be exposed. The question of whether European troops should be located in hill climates and in the plains periodically—that is, in the hills during the unhealthy seasons of the plains, and in the plains during the winter, or continuously in hills and plains for periods of years, is unnoticed by the Royal Sanitary Commission, and misunderstood in a report of the Bengal Sanitary Commission, as pointed out by me in a letter of the 19th of May, 1866, to the Under-Secretary of State for India. The relation of this question to health has been already explained, but the question has also a political and financial relation. The political difficulty which attaches to the continuous removal for lengthened periods of a large proportion of the army from the plains to the hills cannot attach in nearly equal degree to a system which includes the camping of the entire army in the plains during three months of every year, and its annual marching over considerable tracts in its movement to and from the hills. The permanent location of the army in the hills is probably a political impossibility, but the periodical location in hills and plains is surely not so. The diminished cost of sanitary works by absence from the plains in the hot and malarious seasons and absence from the hills in the winter has been adverted to in my former note, but this relation of the question may be regarded from another point of view. Suppose the periodical system adopted and not sustained by experience, it will be easy to extend sanitary works into harmony with the continuous system. But suppose, on the other hand, that the continuous system is adopted and not sustained by experience, then, in reducing sanitary works to the level of the necessities of the periodical system, a lavish waste of public money will have been incurred, from ignoring past experience and the present data of physiological and pathological science.

Edinburgh, February, 1871,