A CLINICAL LECTURE ON ASTHMA AND ITS TREATMENT.

Delivered at the Hospital for Consumption, Brompton,

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DEFINITION.

THE term "asthma" has been somewhat loosely applied to several different pathological conditions and groups of symptoms, the exact nature of which it is important to consider in order to discuss a rational treatment. The term is constantly and wrongly used by patients and others to express the dyspnoea which accompanies emphysema and chronic bronchitis. This is dyspnoea due to pathological changes in the lungs, and is to be distinguished from "cardiac asthma," which is dependent on a condition of the lungs and nervous system induced by a disordered circulation of the blood dependent on disease of the valves or the myocardium; and from "renal asthma," which is possibly to be explained either by the effect of a poison or of disordered circulation on the respiratory centre in the course of disease of the kidneys; and from "pressure dyspnoea" dependent on the pressure of an aneurysm or new growth on the trachea.

SPASMODIC ASTHMA.

Spasmodic asthma, whether primary or secondary, is a disease essentially due to some nervous changes. Its partial heredity, its occurrence largely in "neurotic" individuals, its occurrence in families subject to migraine, as well as the characteristic attacks of the disease, bring it into relation with nerve storms, such as epilepsy. The typical uncomplicated asthmatic attack, as it is seen in children and in some adults, is sudden in its onset, and occurs in the early hours of the morning, between 2 and 4 A.M. It is characterised by intense dyspnoea, in which the patient is unable to assume the recumbent position, but is obliged to hold on to a chair or the bed railing firmly in order to get purchase for the accessory muscles of respiration. The shoulders are raised, and both the natural and the accessory muscles of respiration are contracting vigorously, although the chest moves but little in expansion. The dusky face shows the embarrassment to the circulation and the deficient oxygenation of the blood; the sweating skin shows the great muscular exertion as well as the effect of deficient oxygenation of the blood. The lungs are as a rule actually enlarged during the paroxysm, but auscultation shows that little or no air is entering into them. The respiratory murmur is absent, or whistling and sonorous rhonchi alone are heard. The attack lasts a variable time, and may be over by breakfast time, or it may last for twenty-four hours or longer. After the attack some expulsion of mucus from the lungs occurs, but there is no continued cough or expectoration.

CAUSATION.

Such attacks as these in an individual may be started by very varying conditions, some of which are obvious, others of which are very obscure. I say "started" because the attacks remain practically of the same nature throughout the varying forms of asthma. Hay asthma is a form of the disease directly traceable to the inhalation of the pollen of grasses and flowers; the attacks are of the same nature as other forms of asthma, and may be succeeded in the winter by asthmatic attacks. Again, asthma may be distinctly preceded or excited by indigestion of food—the so-called peptic asthma—the attacks of which usually occur an hour or two after the largest meal of the day.

Asthmatic attacks, are, moreover, initiated by disease of the lungs; thus bronchitis may lead to attacks of asthma—bronchitic asthma. Attacks are sometimes initiated by an infectious disease—either affecting the lungs, such as pneumonia, or the nervous system generally such as influenza. In other cases, asthmatic attacks in association with chronic disease of the nose and throat, an association which is not of such great importance as is sometimes stated. In some cases (summer asthma), the attacks occur for years only in

the summer, disappearing in October or November to recur the following year.

PATHOLOGY.

It is well at this point to consider of what nature are the attacks of asthma, inasmuch as a study of the attacks might indicate an appropriate treatment. Normal respiration is carried out by the muscles of the thorax and diaphragm, the movements being regulated by the respiratory centre in the medulla. This centre has the most complicated relations, since it receives afferent impulses by means of the vagus, and sends out indirect impulses to the thoracic and phrenic nerves. It is, moreover, connected with and influenced by the sensory nerves of the skin and of the upper respiratory tract. The proper working of the centre depends not only on its integrity, that is, absence of local disease and the presence of a sufficient blood supply, but also on the influences which come to the centres from the nerve terminations in the lungs or from the sensory nerves. The centre is in its normal working to some degree automatic. In disease it is obvious that it may be disordered either by disease—functional or organic, affecting it locally, or by influences which start from the periphery either by the sensory nerves of the upper respiratory tract or from the lungs themselves.

There have been many theories to account for the attacks of asthma. The supposition of an acute inflammatory (erysipellatous or bacterial) inflammation of the bronchial tubes may be dismissed at once. Asthma is non-febrile, and is not an acute infectious disease. Another theory supposes that there is a sudden swelling (non-inflammatory or vasomotor) of the bronchial mucous membrane, of which there is no evidence. The most commonly-received idea is that there is a bronchial spasm in which the unstriated muscular fibres of the smaller and non-cartilaginous bronchial tubes is firmly contracted, causing difficulty of the entrance of air.

The phenomena of the asthmatic attack show undoubtedly that something is happening in the lungs themselves. The absence or diminution of the respiratory murmur shows that air does not enter the lungs, or enters at any rate with great difficulty, although the attempts at respiration are extremely vigorous. Why does not the air enter? There is no obstruction to its entrance in the trachea or larger bronchial tubes which contain cartilage. The sudden onset and frequently sudden cessation of the asthmatic attack shows this as well as the fact that external pressure alone can obstruct the cartilage-containing bronchial tubes. The supposition is that the lumen of the soft-walled tubes on their way to join an alveolus is contracted, and thus the obstruction to the entrance of air is produced. One argument in favour of this occurrence is that the auscultatory phenomena of the asthmatic attack are not always, or indeed constantly, observed over the whole of the lung area. Thus in parts the respiratory murmur is inaudible, in other parts audible, and over the same area it may be at one time audible and at another inaudible. This changing localisation of the area of lung attacked is very important in explaining the immediate cause of the asthmatic paroxysm; this must be a cause which is capable of rapidly coming and going. The presence of the muscular fibre and the capability of the contractility of the soft bronchial tube are facts which are the basis of the explanation. A rapid turgescence of the mucous membrane of the bronchial tube, which could only result from a vascular disturbance, might explain the phenomena; but in this case one would naturally suppose that a profuse expectoration of a mucoid and watery liquid would occur after the paroxysm. This, however, does not occur; the expectoration is mucoid and frequently insignificant in amount, and such as is readily accounted for by the relative stagnation of the blood stream and increased venosity of the blood in the lungs during the paroxysm. The most rational view to take is that there is a spasm of the bronchial tubes during the asthmatic attack, and that this accounts for the symptoms observed. But this bronchial spasm is not the only feature to be discussed, and it is not merely an irritant to the air passages that is essential in asthma. Sufficient account has not been taken of the condition of the respiratory centre and of the central nervous system generally.

Cases such as are called "cat asthma" are rare indeed, but do occur, in which the asthmatic paroxysm is induced by the sight (or smell?) of a cat. In this case there is apparently

no local irritant in the lungs themselves tending to produce the attack, but the bronchial spasm must be produced by a reflex effect through one of the nerves of special sense affecting the respiratory centre directly or indirectly through the cerebral centres. Again in hay asthma the peripheral irritant does not get into the lungs, but affects the naso-pharynx, and so leads to the asthmatic attack—it must be in a reflex manner. Again, in bronchitic asthma there is a local irritant in the lungs, the chronic inflammation of the bronchial mucous membrane, which may act as the exciting cause of the asthmatic attack. But it is not every case of chronic bronchitis that becomes asthmatic, and there must be some other condition besides the local irritant in the lungs which leads to the asthmatic paroxysm. Again, influenza, an infective disease which damages the nervous system, is in some cases followed by asthma; and in this case, although there may be a passing lung affection, which may predispose, there must be something else which leads to the asthmatic attacks. This is the condition of the central nervous system—a condition which cannot be defined categorically, but only expressed vaguely as that which is present in the individual predisposed to asthma. One is accustomed to speak of cases of asthma in which the neurotic element largely predominates. Such cases occur chiefly in women, and are characterised by the ready development of attacks under the influence of emotion, passing worry, of the menstrual period or of the menopause. In such cases the disordered condition of the nervous system is the main feature of the asthma. In other cases, again, the main element in producing the attacks is one of peripheral irritation either of the upper air passages (as in hay asthma) or of the bronchial mucous membrane (as in bronchitic asthma).

CLINICAL VARIETIES.

Cases of asthma as they come under treatment present various aspects. In some the attacks recur with their typical symptoms at longer or shorter intervals, and in between the attacks an examination of the chest reveals no abnormal physical sign; these cases are seen more commonly in children under the age of 10 years. But as the attacks recur and the asthmatic stage is prolonged and becomes more irregular, they are associated with bronchitis, and the patients (children or young adults) tend to develop a bronchitic chest as well as emphysema. The condition of things is reversed in bronchitic asthma, in which the bronchitis and winter cough may have lasted some time before the asthmatic attacks develop. The condition of a patient suffering from chronic asthma associated with bronchitis is an unenviable one, especially in frequent changes of weather. In severe cases there is always more or less lividity with dyspnoea on exertion due to the emphysema as well as to embarrassment of the circulation; the asthmatic attacks conduce to the bronchitis, and *vice versa*. Even if such a patient is removed to a climate suitable for the bronchitis, the asthmatic attacks may persist, although not in so severe a form.

TREATMENT.

In considering the treatment of asthma it will be convenient to limit the discussion to the primary spasmodic form uncomplicated by bronchitis and to the form associated with bronchitis, whether this be bronchitic asthma, that is, bronchitis preceding the asthma or a case of primary asthma complicated later by chronic bronchitis. In the latter case the treatment is that of bronchitis as well as asthma, in the former it is that of asthma alone.

It is to be remembered that the attacks of asthma may begin suddenly and cease suddenly; and their sudden cessation is due, as a rule, to no medical treatment, but to some sudden excitement, shock, or some change of life, or to a change of locality. This applies chiefly to those cases uncomplicated by bronchitis. The sudden stoppage of the attacks, even for months, does not preclude their recurrence; indeed, they usually recur. Each case of asthma has its peculiarities as regards the manner in which the attacks are influenced by locality, food, and mode of life.

In discussing the treatment it must be borne in mind, as has already been pointed out, that although it is probable that spasm of the bronchial tubes is the immediate cause of the respiratory symptoms, in some cases the attacks are associated with peripheral irritation (inhalation of pollen,

disease of the naso-pharynx, etc., indigestion of food), and that in all cases of asthma although to a varying degree there is a functional disturbance of the central nervous system and of the respiratory centre.

Sedatives.—It is necessary to treat the asthmatic attack; the patient demands it, and the condition requires it. In uncomplicated asthma sedatives will cut short the attack, such as the hypodermic injection of morphine (grain $\frac{1}{4}$), the administration of chloral, or the inhalation of chloroform. The effect of the latter is evanescent, and is not to be compared in efficiency to either morphine or chloral. The use of morphine or of chloral is to be limited to the attacks, is not to be continued for too long a period, and must be in the hands of the practitioner and not of the patient.

Inhalation.—The inhalation of the fumes of burning nitre paper or specially prepared powders, or of cigarettes, is the popular remedy for the attacks of asthma. In many cases they give relief, in some marked relief. The powders consist of stramonium and nitre chiefly; the one we use at the hospital contains one part each of anise and nitre, two parts of stramonium leaves, and 5 grains of tobacco to the ounce; one teaspoonful is to be burnt on a plate and the fumes inhaled. The cigarettes used are a manufactured article containing stramonium leaves, nitre, and tobacco; they relieve the attacks sometimes when the powder fails. A pill containing $\frac{1}{4}$ gr. of morphine, with $\frac{1}{8}$ gr. of atropine sulphate, given at bedtime, is sometimes useful. Extract of stramonium ($\frac{1}{4}$ gr.) may be substituted for the atropine. I have not found the ethereal tincture of lobelia very useful; but I have not tried it in the way recommended by Hyde Salter, namely, in repeated small doses before the attack is expected.

Treatment of the General Condition.—The relief of the attacks of asthma is a necessity, inasmuch as repeated attacks not only seriously curtail the business and pleasure of life, but conduce in the pure spasmodic form to the super-vention of bronchitis and emphysema. The use, however, of sedatives, such as morphine and chloral, and of inhalations, constitute no treatment of the disease, and must be limited as much as possible, especially in the uncomplicated form of asthma, while efforts are made to benefit the general condition of the patient. Harm is frequently done by the indiscriminate use of inhalations, predisposing as they do by their irritant nature to the super-vention of bronchial catarrh. Of remedies which may be continuously administered to patients who have frequently-recurring attacks, two are most constantly used, namely, iodide of potassium and arsenic. The iodide may be most conveniently given with stramonium, as in the mixture in the Hospital Pharmacopœia, which consists of a quarter of a grain of extract of stramonium, 2 gr. of extract of liquorice, 3 gr. of iodide of potassium, and 5 minims of chloric ether. This mixture may be given two or three times daily in cases of asthma, and in many instances with benefit. In some cases, indeed, although not usually, it promptly stops the attacks. It possesses two drawbacks. The stramonium leads in some cases to paralysis of accommodation which is detrimental to the carrying on of the person's occupation. But by diminishing the dose the patient soon ceases to experience discomfort from the remedy, and I have not yet seen an asthmatic who did not prefer the stramonium, with its drawbacks, to the disease. Some asthmatics, especially those of a highly neurotic temperament, are very susceptible to the action of stramonium; I have seen doses of even $\frac{1}{8}$ gr. of the extract produce dryness of the throat and a state of nervous excitability which necessitated the stoppage of the drug. I think if patients can take the stramonium with the iodide they do better than with the iodide alone. If given alone the iodide must be administered in 5-grain doses two or three times daily, from time to time the medicine being stopped. Arsenic by itself in doses of 3 minims of the liquor arsenicalis is a useful remedy for continuous administration in asthma, and it may be combined with iodide of potassium (3 to 5 gr.) in a mixture.

Peripheral Irritation.—The treatment of local conditions which act as peripheral irritants in cases of asthma need not be discussed at length. With regard to the naso-pharynx, the presence of a nasal discharge (watery and mucoid) in cases of asthma other than hay asthma is by no means uncommon, but is not always associated with serious local disease. The in-

sufflation of a solution of bicarbonate and chloride of sodium, if there is much nasal secretion, is frequently of service, and the application of cocaine in such cases to the nasal mucous membrane is described by the patients as helping to relieve the attacks. Application of the cautery in some cases relieves hay asthma. In children with large tonsils or with adenoids, in whom asthma supervenes, the surgical treatment of the local condition, although it may be necessary, does not of itself cure the asthmatic attacks, which may persist for months after the fauces and pharynx have been successfully treated. The removal of a nasal polypus may greatly relieve the attacks, but not a few cases persist after removal.

Diet.—Chronic asthmatics—that is, those in whom the attacks have lasted for some months or years, are frequently the subject of indigestion of food, as shown in the symptoms of weight and discomfort after food, and flatulence. This is sometimes the result of over-drugging. In the cases of peptic asthma, the regular attacks of the disease occur after a meal, usually the heaviest meal in the day, and are associated with indigestion of food. The regulation of the diet of asthmatic patients is of great importance; meals ought to consist only of digestible food, and that in moderate quantity, no heavy late meals being allowed. Remedies such as alkalies after meals given with the view of correcting the indigestion, combined with a proper diet, give great relief to cases of peptic asthma. Although the asthmatic ought to be careful as regards the food taken, it is wrong treatment to starve such a patient; only harm can come of it, inasmuch as the best chance of the patient recovering is an improvement of his general health, and this cannot occur without a sufficiency of food. It is for this reason, doubtless, that cod-liver oil does so much good in some cases when every remedy seems to have failed. The improvement if the oil can be taken is sometimes very marked, rendering possible the diminution, or even cessation, of the inhalations which the patient considered his sheet-anchor.

The confirmed asthmatical adult can only be relieved, and that sometimes very imperfectly, by the methods which have been detailed; and indeed in some cases all treatment appears of as little avail as in confirmed epilepsy. It is quite otherwise with the asthma of children under the age of 10 years, at which time a large number of cases arise. By treating the attacks by a careful regulation of the diet and mode of life of the child, and by the avoidance of any "hot-house" treatment over a number of years, the asthmatic child loses his attacks without serious damage to the respiratory apparatus.

A CONTRIBUTION TO THE CLINICAL STUDY OF THE GASTRIC JUICE.

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THE two following cases illustrate the importance, both for purposes of diagnosis and treatment, of a clinical examination of the contents of the stomach in cases of disease of that viscus. It is certainly desirable that such an examination should be carried out in all cases of stomach disorder in which the usual forms of treatment do not quickly relieve the patient. Exact quantitative estimation of the constituents of the gastric juice is unfortunately rarely possible in ordinary practice, but sufficient information for all practical purposes of treatment may be gained by some such method of procedure as was adopted in the two following cases, and can be accomplished in half an hour. More exact data to indicate the direction which treatment should take may thus be obtained than by studying simply the patient's subjective symptoms, and sometimes evidence, not otherwise to be gained, pointing to the presence behind ostensible "dyspepsia" of some more formidable disease.

1. ON THE COMPOSITION OF THE GASTRIC CONTENTS IN A CASE OF TABES DORSALIS WITH GASTRIC CRISES IN WHICH HÆMATEMESIS OCCURRED.

In the case described below gastric crises formed the striking symptoms of tabes dorsalis, the other signs being unobtrusive, and they were attended with hæmatemesis, in

the absence of any symptom of gastric ulcer, and with failure of secretion of HCl during the attacks.

S. W., a clothworker, aged 42, complained of severe attacks of vomiting coming on at frequent intervals. He had had no very bad illness, and denied all history of syphilis, but had gonorrhœa at 18 years of age. He attributed his illness to strain during a "tug-of-war" at Aldershot. The first attack of vomiting occurred seven years ago, the next six months afterwards, and during the next two or three years he had about two attacks in each year. Since then they have become more frequent, and during the past year have occurred at intervals of about three weeks. At first they lasted for about half a day, but latterly they have become more violent, and last two to three days. Whilst the attacks last he vomits about every hour; the vomit is intensely bitter in taste, and yellowish or green in colour; towards the end of an attack he has often brought up a fluid like coffee grounds. He can trace no cause for the paroxysms; the kind of food he takes makes no difference; they generally begin in the morning, and leave him much exhausted for a day or so, with a depressing sensation in the pit of the stomach. During the attacks he has an indescribable sensation of 'discomfort in the pit of the stomach, but no acute pain. In the intervals he is well, and does not suffer from vomiting, dyspepsia, or pain in the stomach. Ten weeks before admission he vomited nearly 3 pints of dark-red fluid, apparently blood, with some clots. On examination the patient was sallow and anæmic. The tongue was large, red, covered with a very thin white fur, and indented by the teeth. The thoracic and abdominal organs appeared to be healthy. There was no tenderness in the epigastrium, the stomach was not dilated, and no tumour was felt. The knee-jerks were absent; the pupils were very small, the right being larger than the left, they reacted to accommodation, but not to light. The optic discs were pale; the superficial reflexes were normal. There was no affection of sensation to touch, pain, or temperature, except a little blunting of sensation over the feet. There was no ataxy of gait or other movement. He was not giddy in the dark, and the bladder was unaffected. He had a slight girdle-pain, and on inquiry it was elicited that for at least twelve months he had suffered from attacks of typical lightning pains in the arms and legs, which often came on about two days after a gastric crisis. The urine was normal. From March 10th to 16th the stomach contents were examined at varying intervals, after a test-meal of weak tea, toast, and butter.

The tests used for HCl were Gunzberg's, Boas's resorcin tests, and benzo-purpurin papers, with Congo red papers for detection of free acid. I could not estimate the HCl by the more exact and elaborate methods, but an attempt was made to determine roughly the quantity of HCl by using Gunzberg's reagent after first extracting the lactic acid from the gastric contents by agitating with ether, and separating the ether. Gunzberg's reagent gives a reaction with 0.06 per cent. free HCl, and the 10 c.cm. of gastric fluid was progressively diluted with distilled water until no reaction was obtained, and the percentage of HCl calculated from the number of dilutions. This is, of course, only a rough method, but so far as it went indicated in the following examinations that between the crises the quantity of HCl was much above the normal. The total acidity is given, according to Ewald's plan, in terms of the number of c.cm. of decinormal soda solution required for neutralisation. An hour to an hour and a half after the test meal the total acidity of the gastric fluid withdrawn was 64; the amount of HCl on one occasion at least 0.4 per cent., and a small amount of lactic acid was present. Two to three hours after the meal, total acidity 80, with much free HCl, peptones, and no lactic acid. Four to five hours after the meal the stomach was empty, except on one occasion when it contained a little fluid (four hours later) whose acidity was 108.

On March 17th a gastric crisis began, and continued for 48 hours. The vomited matter was fluid at first, of the colour of coffee grounds, with a few streaks of bright blood, and a quantity of mucus. Under the microscope undigested milk and some altered blood corpuscles were found, but no sarcinæ. Later it became yellow in colour. In all about 80 ounces were vomited, with a total acidity 60, a very marked lactic acid reaction, but no free HCl was present by the above tests. After this attack the stomach contents were examined on three