This relation between the invaders and the original population probably varied from place to place as communities became established; and the variation, together with the influence of genetic drift, could, we suggest, account for the widely different incidences that we have found from tribe to tribe. These differences would persist only if relative isolation continued, and it is generally believed that intermarriage is now common and probably always occurred to some extent.

With these facts in mind, it is of interest to note the suggestion of Lehmann (1953) that the sickle-cell condition may have been introduced in Africa and the Mediterranean region by migrating Veddics peoples.

Intermarriage would tend to reduce the variability caused by genetic drift: although variations in A and B frequencies were also found they did not present the sharp contrasts in contiguous areas shown by the sickling trait, and this may suggest that the A and B genes were introduced earlier than the sickling one. The spread of the B gene in Western Europe has been described by Candela (1942), and similar postulates may apply to the diffusion of the sickle-cell trait in Africa.

Conclusion

At present there is little to suggest that the possession of the sickling gene has any selective value, and the A and B blood groups which show similar though unrelated variations to those of the sickling frequency are also believed to have no survival value, although it has recently been shown (Aird *et al.*, 1953) that some correlation exists between carcinoma of the stomach and the A blood group, and between acquired haemolytic anaemia and group O (Hunt and Lucia, 1953). It is not impossible that sickling may be related to hookworm or malaria or other tropical condition, but so far as our studies have gone we have not been able to show any such relationship. Until some such factor is demonstrated it would seem to us that genetic drift is the most probable explanation of the variations in both sickling and the ABO blood groups in Africans.

Summary

The incidence of sickle-cell trait and the distribution of the ABO blood groups in certain tribes in East and Central Africa are reported.

Considerable variation was found in different tribes and even between subgroups of the same tribe, indicating that surveys done on large heterogeneous groups of Africans are unlikely to give useful information.

Possible explanations for this are considered, and genetic drift is suggested as the most likely.

The question of the introduction, maintenance, and spread of the sickling gene in Africans is discussed.

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ACUTE RESPIRATORY INFECTIONS IN EMPHYSEMA

AN ACCOUNT OF 118 CASES

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The advances in the physiological and pathological understanding of emphysema have not been paralleled by equal success in its clinical management. There may be three reasons for this. First, chronic bronchitis, without doubt the most important single factor in the production of emphysema, is, because of its ubiquity and apparent benignity, regarded as a tolerable evil; secondly, as a result of this the patients are unlikely to consult the physician in the early stages; and, thirdly, as it is a disease which would seem to be both irreversible and progressive, treatment is unrewarding. Because of these considerations the emphysematous patient in a general hospital is usually seen for the first time when suffering from incapacitating dyspnoea, congestive cardiac failure, or an acute respiratory infection. The latter, responsible for about 4% of the total admissions to my wards, may cause sudden and serious illness which is eminently treatable. This paper is concerned mainly with this aspect of emphysema. Similar cases have been studied at necropsy by Spain and Handler (1946) and Scott and Garvin (1941). Fulton (1953) emphasizes that chronic pulmonary disease is an important cause of mortality and morbidity in middle-aged men in the industrial area of Manchester. The diagnosis and treatment of acute respiratory infection in emphysema have been discussed by Cardon *et al.* (1951).

Material

Between March, 1947, and May, 1952, 118 patients with long-standing bronchitis and emphysema have been under my care because of acute respiratory illness. In all but one, progressive dyspnoea was a prominent feature. This one patient, a man aged 63, said that he was not short of breath as a rule, but physical examination, response to oxygen therapy, and respiratory function tests all indicated emphysema.

Of the 118 patients (100 men, 18 women), 48 died—41 as in-patients and 7 within one year of leaving hospital. The remainder were alive and well in the summer of 1952.*

Age Groups.—The ages of the patients were 30–39 years, 3; 40–49, 12; 50–59, 39; 60–69, 49; 70–79, 15.

Previous Medical History

A history of bronchitis of more than 10 years' duration was given by 100 of the 118 patients. There can be no doubt, therefore, of its importance in the evolution of emphysema.

Most patients said that their bronchitis began insidiously in the past and guessed at its duration. Some were more definite and chose as landmarks either the first world war or a previous attack of pneumonia. Sixteen males fixing upon the first world war attributed their bronchitis to gassing, yet only one had been admitted to hospital because of it. Their memory was probably playing them false. The same criticism might be applied to those who dated their bronchitis from a long-distant pneumonia. There were, however, others whose pneumonic illness was more recent, but here again caution must be exercised in relying on the patient's memory, as is illustrated by the following case of

*Since this article was submitted for publication a survey made in December, 1953, reveals that 75 patients are now dead, 25 are alive and well, and 18 have not been traced.

a woman aged 72 who said that her chest trouble had begun two years previously, after an attack of bronchopneumonia. She seemed a reliable witness, yet severe emphysema and hypertrophy of the right ventricle were found at necropsy. It is unlikely that the gross pathological changes could have arisen in so short a time. It seems to me more likely that the acute illness brought to her notice symptoms which had existed but had been accepted by her as "normal." It is indeed remarkable how frequently morning cough and sputum, often attributed to smoking, are regarded as "normal." Until we use a more accurate guide than memory I do not think we should accept the statement that emphysema can follow directly on a bronchopneumonic illness (Spain and Handler, 1946; Barach, 1948).

A history of asthma was noted in 27 and a family history of "chest trouble" in 13 cases. Two patients had severe kyphoscoliosis dating from childhood.

History Taking.—The memories of these patients are often clouded during the acute illness, and the spouse or relatives can give more accurate information. Twenty patients seemed to be mentally clear on admission to hospital, yet on recovery they had complete amnesia for the first few days. I make it a rule, therefore, to confirm the history on recovery. Even when the patient is not acutely ill, it is important to check his history with that obtained from his wife or children.

Clinical Course

I can best illustrate this by recounting in full the following case.

A metal polisher aged 43 was first seen by me on January 18, 1949. At 12 years of age pneumonia left him with a "weak chest." At 19 he stopped playing football because of exhaustion. At 21 annual winter visits to the doctor for cough medicine began. At 26 "double pneumonia" laid him up for five months, and after this his health deteriorated. At 33 bronchitis was present in the summer as well as the winter. At 38 dyspnoea was burdensome. At 40 he was admitted to this hospital (February 1, 1946) extremely ill with a right upper lobe pneumonia; he was discharged on March 3. On January 18, 1949, when aged 43, five days of bronchitis and pleurisy resulted in such a degree of respiratory embarrassment that emergency admission to hospital was necessary. His doctor wrote: "His sputum is rusty. His temperature is not much raised, but this fact was also noted on his previous admission."

On examination he was mentally clear, but very cyanosed, and had the "frog-like" eyes mentioned by Spain and Handler. His sputum was thick and creamy. Examination of the chest revealed evidence of emphysema and universal moist sounds. There was no clinical or radiological evidence of consolidation. The fundi showed papilloedema and the C.S.F. pressure was 330 mm. There was no sign of congestive cardiac failure. The blood pressure was 120/70. Blood count: haemoglobin 78%; red cells, 4,500,000 per c.mm.; white cells, 17,300 per c.mm. (neutrophils 75%). The alkali reserve was 86 vols.%. Sputum culture yielded haemolytic and non-haemolytic streptococci. Screening and electrocardiography confirmed emphysema and hypertrophy of the right ventricle, and it was noted that there was apical fibrosis with drawing up of the lung roots.

He quickly recovered, and on February 28, in the follow-up clinic, declared himself a different man. He was taking ephedrine and having breathing exercises. On holiday in July he could walk five miles at a brisk pace. One further attack of bronchitis on October 31 necessitated hospital admission, but he quickly recovered. During the summer of 1950 his dyspnoea was more severe, but he could walk one to two miles each day to and from work. Between the summer and autumn of 1950 his ankles swelled intermittently and he was able to do light work only. His head became "thick" and he could not read small print. He felt "rough" at times and fell asleep on the lavatory. After an exacerbation of bronchitis with haemoptysis he was admitted on October 23, 1950. There were signs of congestive cardiac failure; oxygen therapy made him drowsy but he recovered satisfactorily.

His last admission was on January 8, 1951, after an attack of bronchopneumonia. He was extremely dyspnoeic, very cyanosed, drowsy but not oedematous, and complained of spots in front of his eyes when he coughed. There were irregular clonic movements involving the upper limbs and even the trunk. His wife had noticed these twitching movements of the arms and legs in bed for some time. He refused to stay in the oxygen tent because he thought he might die in it. Inhalation of oxygen by the B.L.B. mask caused mental confusion and exaggeration of the clonic movements without relief of the cyanosis. We therefore tried to increase his ineffective minute volume by means of a Paul-Bragg respirator, but could not gear the machine to his respiratory rate. Towards the end he sweated profusely and had cold cyanosed extremities suggesting peripheral circulatory failure; in this state he died on January 11, 1951.

At necropsy the lungs showed marked emphysema and basal bronchopneumonia. There was hypertrophy of the right ventricle, but not of the left, and the wall of the pulmonary artery was as thick as that of the aorta. The smaller branches of the pulmonary artery stood out from the cut surface of the lung, but were free from atheroma. The cerebral and choroid veins were greatly dilated, and the brain showed congestion of the grey and white matter.

Comment.—Although this history represents the typical course of the disease there are several further points which need emphasis. Firstly, the time interval between the onset of the acute respiratory infection and drowsiness, irrationality, and even coma may be short indeed. In fact, these mental symptoms may be the first indication of such an infection. Secondly, the height of the temperature is no guide to the severity of the respiratory infection, since in most cases it is either within or only slightly above the normal range. However, the absence of pyrexia may be more apparent than real, as on recovery the temperature is always subnormal. Finally, some patients present with recurring attacks of congestive cardiac failure without any obvious acute respiratory infection as a precipitating factor. Perhaps antibiotics, in curing repeated acute respiratory infections in these patients, can so prolong life that chronic congestive cardiac failure as a result of emphysema is being seen (Christie, 1952; Whitfield, 1952).

Clinical Picture on Admission to Hospital

Three fairly distinct clinical pictures may be seen, depending on the mental state, degree of cyanosis, and physical signs in the lungs.

Acute Bronchiolitis.—The cyanosis is intense, and to one's surprise the abnormal physical findings in the lungs are few; consisting of scattered rales and rhonchi heard principally at the lung bases, without any evidence of consolidation. Six cases presented with this clinical picture.

Pneumonia.—The cyanosis is less intense than in acute bronchiolitis and the abnormal physical signs are greater. An impaired percussion note, together with scattered areas of bronchial or bronchovesicular breath sounds and rales, is found usually at the lung bases. Bronchopneumonia was encountered in 102 patients and lobar pneumonia in 10.

Acute Psychosis.—Hallucinations dominated the clinical picture in two cases and paranoia in one case. In all three the sole abnormality in the lungs was the presence of abundant rales and rhonchi. In one only was papilloedema seen, and that not marked.

A man aged 56 was pensioned from the police force in 1945 because of chest trouble. During the week before admission he had had acute bronchitis and had been "fuddled" in his head. He was suspicious of the doctors and refused to be examined or treated. His mental state was such that he had to be transferred to the mental observation ward of the North Middlesex Hospital, where he died, in coma, after two days. Post-mortem examination showed severe emphysema and a marked cerebellar pressure cone. (This coning was noted in the other two cases.)

Complications

Mental.—When the cyanosis is intense the patient may be euphoric and ignorant of the seriousness of his illness. This was observed in three cases in this series. The clinical

picture may be complicated by drowsiness (8 cases), confusion (10 cases), irritability (10 cases), or coma (2 cases). These mental symptoms are very commonly seen as a result of oxygen therapy.

Cardiovascular.—When the acute respiratory infection produces, as it often does, a severe degree of anoxia, the heart may temporarily enlarge (Ferrer *et al.*, 1950). This is clearly shown in Fig. 1. This patient, a man aged 72, was

FIG. 1.

FIG. 2.

FIG. 1.—Tracing from x-ray film taken on March 25, when the patient, a man aged 72, was extremely cyanosed owing to bronchiolitis. FIG. 2.—Tracing from film taken on May 7 on recovery. Note diminution in size of heart.

admitted on March 19, 1947, with emphysema, bronchiolitis, extreme cyanosis, congestive cardiac failure, and moderate labile hypertension. The recession in heart size after six weeks is shown in Fig. 2. Five years later the heart size remained the same. Each respiratory infection must therefore place a burden on the heart already embarrassed by pulmonary hypertension. Congestive cardiac failure may result. It was encountered either on or shortly after admission in 42 patients, and of these 26 died (3 after discharge from hospital after intervals of nine days, five months, and six months). This is in agreement with the findings of Parker (1940), Spain and Handler (1946), and Fulton (1953). The patients who recovered have been in good health for periods varying from four months to five years. Sinus rhythm was present in all except five patients who had auricular fibrillation. Gallop rhythm was recorded twice. Hypertension was noted in 25 patients, and in three of these the blood pressure was normal in hospital and was observed to be raised only when they attended as out-patients. The blood pressure may be low in patients who are severely anoxic, but this does not seem to influence the prognosis.

Polycythaemia.—Hurtado *et al.* (1945) and Wilson *et al.* (1951) comment on the infrequency of polycythaemia and the frequency of increase in mean corpuscular volume in emphysematous subjects. Wilson *et al.* attribute the latter finding to anoxia. In the present series red-cell counts were done in 32 cases; in 24 the count was less than 5.5 millions, in 6 between 5.5 and 6 millions, and in two above 6 millions. The haemoglobin was determined in 39 cases; in 21 it was 14.8 g.% or less, in 8 it was between 14.8 and 16.2 g., and in 9 between 16.2 and 17.8 g. The mean corpuscular volume was measured in 23 cases; in 9 it was in the range of 78–94 μ^3 and in 14 above this range. As the anoxia was relieved so the mean corpuscular volume fell, but not necessarily to within the normal range. Wilson *et al.* say that the marked polycythaemia which may be seen in emphysema is often associated with severe anoxia and right heart failure. In the present series, of the eight patients with red-cell counts above 5.5 millions, four had congestive cardiac failure.

Sudden Death.—This may occur for no obvious reason, and post-mortem examination may be unhelpful (Brill, 1939; Scott and Garvin, 1941; Spain and Handler, 1946). In this series sudden death with no obvious cause at post-mortem examination occurred on five occasions.

Respiratory Arrhythmia.—On two occasions I have observed that the respirations were irregular both in rhythm and in depth.

Accompanying Diseases.—Carcinoma of the lung was noted twice, angina of effort twice, coronary infarction twice, mitral stenosis once, pericarditis as a complication of lobar pneumonia once, peptic ulcer twice (once with haemorrhage), and carcinoma of the prostate once.

Diagnosis

The diagnosis of emphysema in these patients was relatively easy. Two observations from the foot of the bed are, in my opinion, very suggestive. First, a poor temperature response in the presence of an acute respiratory infection; and, secondly, mental symptoms in an oxygen tent. At the bedside there are two further aids—the fundal appearances (see below) and the fall in the systolic blood pressure on inspiration, which persists even on full recovery. If the blood-pressure cuff is not deflated slowly this finding may be missed. On examination of the chest the three most reliable findings are the equally low position of both leaves of the diaphragm, absence or diminution of tidal percussion (most readily demonstrated on the right side because of the presence of the liver), and poor basal air entry. A non-emphysematous thin person with a long chest may give the impression that the diaphragm is low, but here the basal air entry is good.

Fundi.—In many cases of emphysema the fundi are normal. However, the appearances in advanced emphysema with cyanosis are, in my opinion, characteristic and are unrelated to the presence or absence of polycythaemia. The retina is darker in colour than normal. This is due to anoxia, since it is relieved by full oxygenation. The veins are dilated beyond the usual vein-to-artery ratio of 3:2; they are tortuous and much darker than usual. One must be cautious in interpreting these appearances, since the temporal branches of the retinal vein normally look very full, and experience alone can decide what is abnormal. In cases showing dilatation and tortuosity of the veins the arteries too may be dilated and even tortuous.

In the presence of an acute respiratory infection these appearances are accentuated, and changes in the nerve head may be seen. The papillae may be oedematous or merely pinkish. When examination of the nerve head leaves one in doubt regarding the presence or absence of papilloedema, help may be obtained by observing the venous pulsation therein. If venous pulsation is present spontaneously or is induced after only light pressure on the globe, then it is unlikely that papilloedema is present (Walsh, 1947). Papilloedema was seen in eight patients, and only one of them had polycythaemia. I have previously reported three cases of severe emphysema with papilloedema, but without polycythaemia, which are not included in this series (Simpson, 1948). As the acute respiratory infection subsides, so the papilloedema and other changes regress.

As these patients come into the advanced age group arteriosclerotic retinitis may also be seen.

Differential Diagnosis

Although the diagnosis of these cases is usually easy, difficulty may arise, since an acute respiratory infection may precipitate failure in an overburdened left ventricle. In older people, in whom the presenting symptom is dyspnoea, and who have a raised temperature and moisture in the lungs with some of the physical signs of emphysema, it may be difficult to decide whether the condition is due to emphysema with an added respiratory infection or to left ventricular failure. If the fundal appearances described above are present then one can diagnose emphysema with assurance. A short history of dyspnoea, with little antecedent chest trouble, moderate cyanosis, normal or arteriosclerotic fundi, and an immediate response to intravenous aminophylline, favours left ventricular failure.

Post-mortem Findings

Thirty-six post-mortem examinations were done on 41 patients who died in hospital.

Lungs.—Both emphysema and pleural adhesions of greater or less degree were always found. An acute bronchiolitis

or pneumonia was seen in all except those dying suddenly and unexpectedly. Pulmonary oedema was often observed.

Heart.—The heart was studied in 30 cases. Measurement of the thickness of the muscle wall was not regarded as an accurate method of assessing ventricular hypertrophy. Without previous fixing, the weight of the free wall of each ventricle, together with a portion of the septum, as in Herrmann and Wilson's (1922) method, was determined. Although we cannot claim that our results show the accuracy of Lewis's (1914) method, they confirmed the visual impression of right ventricular hypertrophy in every case. The ratio of the weight of the left ventricle to that of the right, determined as above, was 1.2 to 1 or less in all except three cases, and in each of these systemic hypertension was present.

Pulmonary Artery.—Atheroma of the main trunk or of the smaller branches was noted in 12 cases, and its degree bore no relation either to the severity of the emphysema or to the size of the right ventricle. This is in agreement with the findings of Parker (1940). At necropsy on one case the right ventricle weighed 320 g. and the pulmonary artery was larger in diameter than the aorta, yet atheroma was limited to the main trunk of the pulmonary artery. However, in most cases the smaller branches of the pulmonary artery were much less translucent than normal, indicating fibrosis of the walls.

Brain.—In cases in which severe anoxia was present, but more especially after death in an oxygen tent, the cerebral venous system was very congested. This vascular congestion was seen in the grey and white matter, and in most cases the choroid and internal cerebral veins were very conspicuous. Venous oozing was seen in two cases—once into the lateral ventricle and once into the surface of the brain. The cerebral ventricles were not dilated, nor were the convolutions flattened.

Cerebellar Pressure Cone.—A marked cerebellar pressure cone was seen in four cases, three dying with psychotic symptoms and one dying suddenly and unexpectedly without mental symptoms. This is presumably due to the raised cerebrospinal fluid pressure which occurs in severe emphysema, as a result of the disturbance in blood gases, and may cause papilloedema (Simpson, 1948).

Treatment

This can be divided into two sections: treatment of the acute respiratory infections necessitating admission to hospital and treatment on recovery.

(a) Acute Respiratory Infection

Barach (1948) says that an acute respiratory infection in an emphysematous subject should be treated as an emergency, and with this I wholly agree. I would like to re-emphasize that a low oral temperature, if the patient can keep his lips closed, does not necessarily mean that the infection is a slight one.

We find that the majority of these respiratory infections respond to penicillin, which can be given either as procaine penicillin G, 300,000 units, or as penethamate hydriodide ("estopen"), 500,000 units, once or twice daily, depending on the severity of the infection. If a response to penicillin is not obtained, chloramphenicol is usually effective; and, in cases not responding to either of these, sensitivity tests done on sputum cultures will indicate the appropriate antibiotic.

From the general practitioner's standpoint certain events make hospital admission imperative: (1) persistence of a raised temperature in spite of treatment; (2) severe infection as indicated by intense cyanosis, drowsiness, muscular twitching, irrationality, acute psychosis, or coma; and (3) congestive cardiac failure.

Mental symptoms, seen especially after oxygen therapy, may require sedation, and it is important to remember that morphine is lethal to these patients. Barbiturates, too, are better avoided. Paraldehyde, 5 ml. intramuscularly and repeated if necessary, seems to be the best sedative to use.

Antispasmodics are of little use to the acutely ill patient, but if progress is delayed or if relapse should occur the combined use of postural drainage and antispasmodics may be very effective in promoting recovery.

Oxygen Therapy

Mental symptoms or even coma may ensue when oxygen is given to these patients, especially the very anoxic ones (Richards, 1950). Studies at this hospital suggest that the mental symptoms are due to carbon dioxide narcosis, but other theories have been advanced and discussed (Comroe *et al.*, 1950; Mithoefer, 1952). However, I agree with Barach (1948, 1950b) that the occurrence of these untoward symptoms should not deter us from continuing with oxygen therapy, although nursing may be difficult. In the present series mental symptoms or coma were seen in 49 patients, and 17 of them died (see Table).

Mental Symptoms During Oxygen Therapy

Year	Total Admissions	No. Treated	Mental Symptoms or Coma	Died
1947	10	6	2	0
1948	14	6	5	3
1949	20	6	4	2
1950	20	12	9	5
1951	41	27	20	4
1952	13	13	9	3

Oxygen may be given by nasal catheter or tent (Simpson, 1936). The patients included in the table were so severely ill that it was thought advisable to put them at once into an oxygen tent, and they were left in even though mental symptoms or coma supervened. Although this procedure was far from ideal, I am convinced that more lives were saved than lost by this means.

As an alternative Barach (1948) advises that if the patient is severely anoxic, and hence more prone to carbon dioxide narcosis, oxygen should be given initially by nasal catheter at a rate of, say, 3 litres a minute, and the rate of flow *gradually* increased. He suggests that when the patient is acclimatized to a high concentration of oxygen in the inspired air then a tent can replace the catheter. He does this to avoid a rapid rise of arterial carbon dioxide, with consequent lowering of the arterial pH which occurs in the tent and which, he thinks, is the cause of the coma rather than the raised arterial carbon dioxide itself. In other words, patients can tolerate a high arterial carbon dioxide if it is *gradually* produced (Barach, 1950a).

I have, more recently, used this method in severely ill and disorientated patients and have avoided coma, which, I feel sure, would have supervened had they been put at once into an oxygen tent. I therefore now use Barach's method in every case except those in which urgency demands the use of an oxygen tent. Coma in the tent is by no means necessarily fatal. Even if the patient dies in the tent, it must be remembered that the severity of the infection, the duration and degree of the anoxia, and the cardiac status all have an important bearing on the immediate prognosis.

My instructions to the nursing staff when the nasal catheter is used (preferably Tudor Edwards spectacles) are to watch for coma and not to worry about the relief of the cyanosis. If coma supervenes then the rate of flow of oxygen must be reduced.

Mental symptoms or coma are not commonly seen after oxygen therapy in the less cyanosed, less ill case, and a tent may be used from the beginning.

The use of antibiotics, by clearing the bronchial tree, lessens the anoxia and therefore the complications of oxygen therapy. When the patient remains in coma in the oxygen tent and the condition becomes grave the use of a respirator has been recommended (Boutourline-Young and Whittenberger, 1951). When I have used the tank or cuirass type of respirator I have found, like them, that the respirator cannot be set to the rhythm of the patient's functioning but depressed respiratory centre, and that therefore it is of little assistance.

(b) After-treatment

After recovery, I attach the greatest importance to the mental outlook of the patient. He should be made to feel that he is not just a "chronic bronchitic" for whom nothing can be done. He should be able to apply at any time for advice or treatment and attend the clinic at least at six-monthly intervals in the autumn and spring. Enthusiasm in treatment also helps a lot in getting his co-operation and confidence.

The patient should stay indoors in foggy weather and avoid, so far as is possible, direct contact with people who have an upper respiratory tract infection. The relatives must be told to look out for signs of trouble, such as drowsiness and muscular twitching, and report them at once to the doctor. If the patient should have a chest infection he should go at once to bed in a warmed room. This is important, since I have repeatedly had patients relapse who went from the centrally heated atmosphere of the hospital to the cold conditions of the home.

Breathing Exercises.—Diaphragmatic and other breathing exercises are taught routinely, but, unfortunately, patients often forget to do them at home. There is no doubt of their value. After the breathing has been improved by these exercises I use a modification of a method described by Reed (1952). First of all the positions of the head and body on expiration and inspiration are demonstrated. On expiration the head is flexed, the spine bowed, the body and arms relaxed; and on inspiration the head is extended, the chin tucked in, and the spine extended. The patient then breathes in and out as deeply as he can, assuming these positions at the end of inspiration and expiration. Next he walks, continuing to breathe in this fashion. He finds that he takes so many steps to each inspiration and so many to each expiration. He is then told to continue walking and breathing like this on discharge from hospital.

Antispasmodics

Ephedrine, being undoubtedly the drug of choice, was prescribed routinely, and only 11 patients did not tolerate it, usually owing to its effect on micturition. I start with $\frac{1}{2}$ gr. (32 mg.) t.d.s. and increase by $\frac{1}{2}$ gr. daily to the limit of tolerance, as judged by difficulty in micturition, tremor, or nausea. No symptoms referable to the cardiovascular system were observed. When this point has been reached the daily dose is reduced by $\frac{1}{2}$ gr. (32 mg.) or more, so that toxic symptoms do not continue, and I give it during the week, but not at week-ends (Herxheimer, 1946). One of my patients says he is much worse if he does not take it continually, and another finds that 1 gr. (65 mg.) before bedtime ensures a good night's rest. Often I give the ephedrine in a freshly prepared mixture containing phenobarbitone soluble, $\frac{1}{2}$ gr. (32 mg.), syrup of codeine phosphate, 30 minims (1.8 ml.), in stramonium and potassium iodide mixture (*B.P.C.*, *N.F.*, 1952) or mixture of creosote and potassium iodide (*B.P.C.*).

Hypertension does not contraindicate the use of ephedrine. In my experience aminophylline is very inferior to ephedrine and less well tolerated, and I use it only in patients with severe bronchial spasm. In these it is most useful administered as a 0.5-g. suppository at night. Aerosol inhalations of adrenaline, phenylephrine, or isoprenaline produce fleeting benefit, and also are of greatest use in the asthmatic patients. Inhalation of oxygen alone will often relieve the dyspnoea of the emphysematous patient. Therefore, in attempting to assess the value of any inhaled antispasmodics, it is essential that the gaseous part of the aerosol should be *air and not oxygen*. Isoprenaline, 10 or 20 mg., sucked under the tongue may be of benefit in the ordinary case of emphysema, but the side-effects of palpitation, headache, and tremor often preclude its use.

For control of the cough at night I use codeine phosphate, $\frac{1}{2}$ –1 gr. (32–65 mg.), or codeine linctus (*B.P.C.*), 60 minims (3.6 ml.). For headache I find caffeine citrate, 10 gr. (0.65 g.), effective. There is no doubt that those who smoke are improved if they can stop it. Following the observa-

tion of Whiteside and Coigley (1952), I have used hexamethonium bromide in one case only, but without benefit.

(c) Congestive Cardiac Failure

In this series, 42 patients had sacral or ankle oedema, either on or after admission. Of these, 26 died (three after discharge from hospital). After control of the respiratory infection the oedema often subsides. If, however, this persists, it may be treated with digitalis, low-salt diet, and mercurial diuretics. There is, as in the rheumatic heart case, a "point of no return" beyond which oedema remains in spite of all drugs, and then acupuncture brings temporary relief. I have had to perform this only once.

Summary

During the past five years 118 emphysematous patients with an added respiratory infection were admitted as emergencies under my care. Forty-five died. Although congestive cardiac failure might complicate the issue, as it did in 42 patients, 26 of whom died, for the most part three clinical pictures were presented: acute bronchiolitis with its accompanying acute anoxia; pneumonia; and, rarely, a psychotic state. The first two groups could be complicated by mental symptoms, especially after oxygen therapy. The presence of a marked cerebellar pressure cone was noted at necropsy in three psychotic patients. Of the 70 patients given oxygen therapy, 49 had mental symptoms or lapsed into coma, and 17 of them died: it is emphasized that in the most severely ill cases oxygen therapy should be continued in spite of these untoward symptoms. However, for the safer administration of oxygen the reasons for using a nasal catheter as against a tent are discussed.

Study of the natural history of emphysema shows that the outlook is not good, many patients dying in the sixth and seventh decades or even earlier, and they are often incapacitated before this in the wage-earning period of life. The clinical diagnosis of emphysema is discussed, and the diagnostic value of the fundal appearances is emphasized.

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