Psychological factors in asthma: a review of their aetiological and therapeutic significance

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'This disease has many aetiological aspects, and should be treated according to the various causes . . . it cannot be managed without a full knowledge of the patient's constitution as a whole . . . furthermore I have no magic cure to report'. Moses Maimonides (1135-1204), On Asthma.

Lability of the asthmatic bronchial tree

Bronchial asthma has generally been regarded as a disorder of multiple aetiology in which infective allergic and emotional factors, acting separately or in combination, bring about attacks in a person who is genetically and constitutionally predisposed.

Scadding (1963) has defined asthma as 'A disease characterized by variable dyspnoea due to a widespread narrowing of the peripheral airways in the lungs and varying in severity over short periods of time, either spontaneously or as a result of treatment'. This definition has the advantage of allowing physiological measurements of airway obstruction to be used as a basis of diagnosis, but it has the disadvantage that it tells us nothing about the asthmatic subject when he is free from attacks. It was Jones (1966, 1971) who first attempted to characterize this instability of the bronchial tract and to give some measure to it, pointing out that tests of ventilatory function such as the forced expiratory volume in one second (FEV₁) may be normal at times in some subjects with severe asthma. He had previously shown (Jones, Buston & Wharton, 1962) that exercise in asthmatics is followed by bronchoconstriction as indicated by a fall in the FEV₁, whilst maximum bronchodilatation as indicated by a rise in FEV₁, could be produced by inhalation of isoprenaline followed by 1 min exercise (Jones, Wharton & Buston, 1963). Using these observations he expressed an index of bronchial lability as follows:

$$\text{Lability Index} = \frac{\text{Fall of FEV}_1 + \text{Rise of FEV}_1}{\text{Predicted normal FEV}_1} \times 100$$

This index was found to be less than 15% in normal children and almost always above 20% in asthmatics, sometimes as high as 85%.

In a parallel investigation, Jones & Jones (1966) studied a group of young adults who had had asthma in childhood but who had been free of asthma for an average period of 4 years. These subjects were found to have an abnormally high lability index as compared with a group of normal subjects, and this was unrelated to the agents (allergy, infection or emotion) which were thought to have precipitated the attacks. The authors point out that it is difficult to postulate whether this mechanism was present before the onset of symptoms. They suggest that a follow-up study of hay fever patients might elucidate this, as a substantial proportion of them will eventually develop asthma (Frankland & Gorrill, 1953), and they reported that six of thirteen children with hay fever had a high lability index. In commenting on this work, the *British Medical Journal* concluded that asthma is 'primarily an inborn defect the expression of which at any one time depends on environmental and psychological circumstances'. In a review of 611 patients with asthma in whom the onset was before the age of 30, Bruce-Pearson (1968) similarly concluded that the main inherited abnormality is an unstable bronchial tract which readily contracts in response to a variety of factors acting as direct irritants, indirectly through the central nervous system, or through allergic mechanisms. It would be tempting to suppose that the measurable factor of lability of the bronchial tree is what is genetically determined, but there is as yet no evidence on this point.

We may now consider some of the factors that impinge upon this labile bronchial tree. This review will be confined to the emotional aspects of the allergic response, to the nature of the emotional factors themselves and their mechanism of action, and to the consequent lessons for treatment that can be learned.

The emotions and allergy

The response to *any* stimulus must depend upon the level of arousal of the person to whom it is applied. An excited person will not sleep with a dose of sedative which would otherwise be adequate for him, and the nervous person would be the first to

cough in a smoky atmosphere. Trousseau was himself an asthmatic, and he reports (Trousseau, 1867) that the worst attack of asthma he ever had came on when, suspecting his coachman of dishonesty, he went up to the loft himself and had the oats measured in his presence. He said that doubtless the attack was caused by dust, but that it was unquestionable that this dust was not enough to bring on of itself such an extraordinary attack. 'I had a hundred times been exposed to an atmosphere of dust considerably thicker . . . it had acted on me whilst I was in a peculiar state. My nervous system was shaken from the influence of mental emotion caused by the idea of a theft however trifling committed by one of my servants, and a cause slight in itself had acted on my nerves with extreme intensity. You will find in books analogous cases.'

It is by now well known that when Dutch asthmatic children were sent to boarding school in Montreux, Switzerland, before the second world war, the Swiss noticed that the school was better for Dutch children than for local children. After the war, because of shortage of foreign currency, the Dutch built their own school at Hilversum and obtained just as good results. In both cases exacerbations were observed on visiting days, on days before holidays and at times of excitement (Bastiaans & Groen, 1955). Harold G. Wolff and his co-workers showed many years ago (Holmes, Treuting & Wolff, 1949) that the amount of pollen needed to produce hay fever is smaller during a stress-provoking interview than at rest. The same type of situation has been demonstrated in asthmatics by Groen and his group (Groen, 1964), where the decrease in vital capacity due to the inhalation of allergens was shown to depend upon the emotional state, which was varied from time to time during the observations by introducing emotionally charged topics derived from the patient's history.

Mason & Black (1958) in a very well designed experiment showed that the response to an intradermally injected allergen can be altered and even abolished by hypnosis. Their subject was a young woman who had had a variety of treatments for very severe summer hay-fever/asthma from which she had suffered for 12 years. They relieved her symptoms by weekly sessions of hypnosis, and showed that at the same time her sensitivity to the pollen antigens declined progressively to zero. At the point where her skin had no response to allergens, the injection of her serum intradermally into a non-allergic volunteer made it possible to demonstrate the passive transfer of the skin sensitivity to the original allergen (Prausnitz-Kustner reaction).

The role of allergy in the aetiology of asthma is, of course, extremely important. There is, however, too great a readiness to assume that it plays an im-

portant part in all, or nearly all patients. In a large number of patients there is no evidence of a specific hypersensitivity on skin tests, and only some patients with positive skin tests show a significant decline in ventilatory capacity of more than 10% when the allergen is inhaled. That a large number of patients in whom allergy cannot be demonstrated show eosinophilia in the blood and in the sputum, and respond to corticosteroids, may be presumptive evidence of an allergic basis (Parish & Pepys, 1968), but one should at the very least keep an open mind that new evidence in the future may permit other interpretations to be made of this.

Psychological factors in aetiology

Comprehensive reviews of psychiatric aspects of asthma are given by Stokvis (1959) and Leigh & Marley (1967). The special problem of childhood asthma has recently been discussed by Pinkerton & Weaver (1970). That there is an important connection between the emotions and respiration is evident when we consider such everyday experiences as laughter, sobbing or catching one's breath with excitement. Most patients, and of course many physicians, are well aware of the role of the emotions in asthma; Hippocrates wrote, 'the asthmatic should guard himself against his own anger'. Evidence that there is a genetic link with psychiatric disorders was the demonstration by Leigh & Marley (1967) of a higher incidence of psychiatric illness in the family history of asthmatics than in controls.

How frequently are emotional factors important in asthma? Rees (1956) tried to quantify the part played by the various aetiological factors in 441 patients with 321 controls. He found that psychological factors were important in 70%, infective factors in 68% and allergic factors in 36%. But probably a more important finding was that psychiatric factors were *exclusively* present in only 1%, infective in only 11% and allergic factors in only 3%. In this study the type of emotion varied widely, e.g. anxiety with tension; anticipatory pleasurable excitement; frustration; anger; resentment; humiliation; depression; guilt; joy. More important than the type was the fact that the emotion was suppressed or inadequately expressed.

With regard to the personality of the asthmatic, Rees found in the same study that there was no evidence of specific life situations or personalities, though overt anxiety, timidity, oversensitiveness and marked obsessional traits were commoner in patients than in controls. The Chicago group of workers, on the other hand (Alexander, 1950; Gerard, 1953; Alexander, French & Pollock, 1968) have described a specific personality characteristic based on their psychoanalytical investigation, not only for asthma but for other psychosomatic disorders. They claim

that the central conflict in asthma stems from internal impulses that threaten a person's attachment to the mother, and that there is a conflict about crying which is inhibited because of fear of maternal repudiation, so leading to reinforcement of abnormal alternative respiratory responses on the part of the child. In a very carefully controlled study of seven psychosomatic disorders (asthma, rheumatoid arthritis, ulcerative colitis, essential hypertension, neurodermatitis, thyrotoxicosis, duodenal ulcer), they took psychiatric interview protocols and expurgated them of even the subtlest clues as to the organic diagnosis. These protocols were then given to a team of judges, who arrived at a psychodynamic formulation, on the basis of which they were able to diagnose the disease from which the patient was suffering in a significant proportion of the patients. Notwithstanding this and other contradictory results in personality studies in asthma, the one thing that does seem to emerge is that asthmatics do not readily express their feelings, especially anger. They are sometimes aware of this, and when asked, often say, 'I never quarrel', 'I bottle it up', 'I sulk', but it is often the spouse or other member of the family who is more aware of this characteristic than the patient.

Anxiety, suggestion and conditioning have all been shown to play a part, separately or in combination, in the aetiology of asthma. In experimental work in animals, a syndrome like asthma has been produced by various workers using painful stimuli (Gantt, 1944; Liddell, 1951; Masserman & Pechtel, 1953). The disturbance was sometimes a direct response to the stimulus used, but at other times it seemed to be a conditioned response. Ottenberg *et al.* (1958) were able to produce asthma in guinea pigs as a conditioned response to a sound. They also sensitized guinea pigs to egg-white, producing asthma, and later found that the asthma developed when the animals were placed in the experimental chamber in the absence of egg-white. The asthma had thus become a conditioned response, conditioned to a stimulus, the chamber, which normally would be innocuous. In contrast to this technique of classical Pavlovian conditioning, Miller (1969) has succeeded in producing conditioned autonomic responses by supplying rewards to his animals *contingent* on the appearance of the appropriate response. This technique is known as operant conditioning, or trial and error learning, and is seen in its most typical form in the classical experiments of Thorndike. In these a hungry cat was placed in a box from which it could escape by pressing a lever, and food was placed outside the box. After a series of random movements, he pressed the lever by accident, escaped and ate the food. On being replaced, the time taken to escape decreased with each trial. Here, the reinforcement of the response by the

reward has *followed* the appearance of the correct response.

In classical conditioning (e.g. the conditioning of salivation to the ringing of a bell) the reinforcement must be by an unconditioned stimulus (food) that already elicits the response (salivation). In operant conditioning, many different rewards could be given (the response having preceded them), or the same reward could be used to reinforce a variety of responses. As Miller (1969) points out, operant conditioning has been regarded as a higher form of conditioning, and was considered important in the learning of voluntary behaviour, while classical conditioning was inferior, and was appropriate to visceral responses mediated by the autonomic nervous system, which could not be influenced by operant conditioning. In a series of elegant experiments he has shown that autonomic responses such as heart rate, intestinal activity, glomerular filtration rate and blood pressure could be influenced by operant conditioning, and he concludes that his work 'removes the main basis for assuming that the psychosomatic symptoms that involve the autonomic nervous system are fundamentally different from those functional symptoms, such as hysterical ones, that involve the cerebrospinal nervous system'. However, Miller's observations have been in animals, and although there is some evidence that the same is true in man, this is not proven, notwithstanding Miller's remark that 'I believe that in this respect, people are as smart as rats'.

In parallel with these observations in animals, Dekker & Groen (1956) showed in the laboratory that attacks of asthma could regularly be reproduced in asthmatic patients by inducing anxiety. They did this by discussing with each patient emotionally-charged material derived from his history. A more general type of study, where the same suggestion was given to each of a group of asthmatics, is reported by Luparello *et al.* (1968). They measured changes in airway resistance directly by body plethysmography. They showed that asthmatic subjects reacted with increase in airway resistance when given nebulized saline to inhale, and were told it was the allergen which the patient had previously stated was associated with his attacks. Nineteen of forty asthmatics showed a significant increase in airway resistance, and twelve developed attacks of bronchial spasm which were reversed with an inhaled saline placebo. Both anxiety and suggestion may have been operative in this study, but in a later study (Luparello *et al.*, 1970) suggestion alone was shown to have a powerful effect on the bronchi. In this study isoprenaline and carbachol were each presented to twenty asthmatic subjects by inhalation. Each drug was presented twice under double-blind conditions. In one presentation the subject was told that it was a

bronchodilator, would open his airways and make it easier to breathe, and in the other he was told it was a bronchoconstrictor. The suggestions produced significant changes in the response to the drugs in the directions that had been suggested.

Conditioned responses were observed by Dekker, Pelsler & Groen (1957) in human subjects, who at times, would respond with asthmatic attacks even to the insertion of the mouthpiece of the experimental apparatus. This is a form of conditioning by 'stimulus generalization', and is analogous to the well known situation where someone who knows that a particular flower will produce an attack of hay fever, develops such an attack when he sees a paper imitation (Mackenzie 1886; Vaughan, 1939).

It is important to remember that an illness may start mainly as allergic, and later emotional or infective factors may become dominant in determining whether attacks occur. Furthermore, at an early stage, the psychological factor may be mainly anxiety, but as the illness persists suggestion and conditioning may also begin to play a part. Even where anxiety does not appear to have initiated an attack, once the asthma begins it will result in a great deal of fear, which will tend to perpetuate it, and so a vicious circle is created. While the psychological factor is rarely, if ever, the sole aetiological factor in the asthmatic, it is sometimes the only *remediable* factor. Rackemann (1958) who had first proposed the division of asthma into extrinsic and intrinsic types (Rackemann, 1918), wrote that 'It has taken much too long to appreciate that in most of the cases the causes are mixed', and that many cases of extrinsic asthma if followed up for a sufficient number of years, become intrinsic in type.

Mechanism of production of symptoms

With regard to the mechanism of the production of symptoms by psychological factors, Dekker & Groen (1957) made interesting observations on the bronchi to which, I believe, insufficient attention has been paid. They point out that asthmatics can demonstrate attacks of wheezing voluntarily, and that known asthmatic subjects can learn how to do it by compressing the thorax with the thoracic, abdominal and cervical muscles. The narrowing of the trachea and main bronchi as seen on X-ray, when produced voluntarily, was exactly similar to that seen in the same subjects when produced by histamine or by an allergen. In an isolated lung made to expire under external pressure, a wheeze was produced in the trachea which could be seen to be compressed. More recently the same team have demonstrated these changes very beautifully on cine film.

On the other hand, McFadden *et al.* (1969) investigated the asthmatic response to suggestion and showed that it could be abolished by atropine

sulphate, so that it was presumably mediated through efferent cholinergic pathways, not through the voluntary muscles of respiration. Perhaps both pathways are important, and the work of Moran Campbell and his co-workers may be relevant here (Campbell *et al.*, 1961; Campbell & Howell, 1963). They conclude that the mechanism whereby respiratory loads are detected in man probably depends upon a sensation of 'length-tension inappropriateness' which arises in both the lungs and in the thoracic wall. It could be supposed that under the influence of anxiety, or as a result of the development of conditioned respiratory responses, the responses to the receptors in these situations could become faulty, and might initiate an asthmatic attack, which, once started, continued as a result of the arousal of further anxiety and the development of a vicious circle.

In animals, Schiavi *et al.* (1961) have shown in guinea-pigs that the response to fear may not be the same as the response to allergens. They showed that whereas the respiratory pattern after a pain/fear stimulus was similar to that in experimental allergic asthma, and was characterized by shortened inspiration and prolonged expiration, the mechanical properties of the lungs were different in the two situations. In experimental allergic asthma in the animals, there was evidence of bronchiolar obstruction as measured by an increase in airway resistance and decrease in compliance, but in those animals exposed to electric shock, there was no evidence of increased airway resistance.

Treatment

All aetiological aspects—infective, allergic and emotional—should as far as possible be treated simultaneously, and this would seem to be the ideal condition for the management of the patient jointly by the psychiatrist and the physician—collaboration which I have found very rewarding. In considering the psychiatric aspects one should remember that just as the emotional factor is one amongst others, so it may itself represent the summation of a number of different stresses and strains which are acting upon the patient. Furthermore, anxiety, suggestion and conditioning may all be playing a part, and need to be considered when planning treatment. Although the importance of the emotions in asthma is mentioned in most textbooks, in practice events of emotional significance seem frequently to be overlooked or not elicited, even though sometimes they can be major events in a patient's life, such as a bereavement or the break-up of a marriage. In this connection I have reviewed the reasons for referral of asthmatics to me at the Brompton Hospital (Cohen, 1967). As part of another study I found that in twenty-two consecutive asthmatics, only four were

referred during their first admission. In these four patients, the reason for referral was the presence of overt psychiatric symptoms (e.g. weeping). In the remaining eighteen patients, the fact of re-admission seemed to be the main reason for referral, as fourteen were referred during an admission which began within a month of a previous discharge, and the interval was sometimes as short as a few days. Like the weeping in the first group, this shuttling between home and hospital is taken as a sign that there is an emotional problem, though on the whole it would be more logical to try to find this out by asking the patient, who will usually tell you what the problem is.

One might therefore ask why this sort of information is so commonly not elicited, and as far as I can tell this does not seem to have anything to do with whether the doctor is more or less sympathetic towards the patient. Eliciting the relevant information is an active process of asking the right questions and of creating the right atmosphere, and this is something that can be taught and can be learned. You have somehow to create a permissive atmosphere in which the patient feels free to talk, and feels that the doctor has an interest in what he says. The patient will usually explain what the trouble is if you have a little patience and ask the right questions, but you can only find out what questions to ask and on what area to focus by taking a comprehensive history, i.e. a life history (sometimes called a psychiatric history). You may then be able to see why Mr A. responds to a given situation in his particular way while Mr B. does not.

The systematic taking of the history will often be sufficient to create the permissive atmosphere. The majority of asthmatics are more than normally concerned to present an intact emotional exterior to the world. Questions directed into sensitive areas are commonly answered by socially acceptable replies. If one covers the whole life history systematically, so that each area is considered equally, the patient's confidence is gradually gained, and the replies obtained will tend to reflect his real situation more closely. As a result one can usually make an intelligent guess as to where, if anywhere, the emotional difficulties lie, and then one can focus more closely on this area. What the patient says is a clinical fact to be integrated with the other facts of the case, and while diagnosis in the last resort always depends upon what the patient can tell you, you may have to show him how to do it.

Once the facts have been elicited, the treatment in many cases is often a matter of commonsense. It may, for example, involve seeing a married couple together for one or two interviews to sort out some particular problem. On the other hand, a relatively lengthy treatment with psychotherapy may be necessary. It is, however, important to emphasize that an

enormous improvement can frequently be achieved by the expenditure of very little time by relatively simple management. It is very important not to have too ambitious a goal. Many patients have asthma of a severity to which they have become adequately adjusted, but from time to time there are severe exacerbations which may be due to a variety of physical and emotional factors. When these are dealt with the asthma subsides to its former manageable level, and it is this, rather than complete freedom, that must often be the goal.

One important and treatable disorder which may lead to an exacerbation in this way is the supervention of a depressive illness, and it is only when this is recognized and adequately treated that the asthma again becomes manageable.

In my experience many physicians do not refer patients because they believe treatment will take a great deal of time, and many psychiatrists are reluctant to undertake treatment of asthmatics for the same reason. The more difficult problems do, of course, take an enormous amount of time, but a large number of patients can be dealt with quite briefly and very satisfactorily. To spend 4 or 5 hours with a patient may seem a long time to a physician, but it may not seem long to a cardiac surgeon, and it may save a large number of visits to the outpatient department, or repeated admissions to hospital. The following case history illustrates this:

A man of 59 had been continuously ill for a year with severe asthma. He had been in hospital five times, and was on large doses of steroids. When first seen in his fifth admission, the notes described his condition as 'terrified'. The following story emerged: He was the third of six siblings, the second one of whom had died of disseminated sclerosis many years earlier. The eldest died of disseminated sclerosis one month before the patient's asthma began. He said, 'I thought to myself, if there is one in the family, then two in the family, then there could be three in the family'.

He might perhaps have managed to get through this difficult period but for the fact that about 2 months earlier his boss had died. He had been in the same job for 36 years, but shortly after the death of his boss the business was put up for sale, and he realized that at his age it would not be easy for him to find another suitable job. He told me that his failure to work was his greatest fear and had the most to do with his asthma. I thought his asthma had begun in the emotional setting of these extremely frightening events—fear for his livelihood and then, 2 months later, for his life. Treatment before I saw him with steroids and antibiotics was successful, and he was able to return to work, but some months later he developed weakness and wasting of the legs, due to a myopathy, the consequence of the steroids

he was receiving. Treatment was then changed to injections of ACTH, but in spite of this and other methods of treatment, his asthma became very severe indeed, and on two occasions he nearly died. He had, of course, come to the conclusion that the weakness in his legs was due to disseminated sclerosis, and that was why he was terrified. After the first consultation, which lasted about 1½ hr, in which all this was clarified, he was well enough to be discharged. In taking an optimistic view of his prognosis with him, it was very important in order to reduce his fear, to convince him that what he was being told was true, and in order to underline this we took active steps through our Social Work Department to find him work. At the end of 3 months, during which he was seen four times as an outpatient, he was well, working, and taking no steroids, and he remained well in the ensuing 2 years.

This illustration of the summation of emotional factors and of the way simple psychotherapy may proceed in asthma, while not an everyday experience, is by no means uncommon. Many patients, however, present more complex problems, and may then have to be dealt with much more intensively, although the particular method of psychotherapy used will depend more upon the nature of the patient's problems than upon the fact that he has asthma. Psychotherapy acts principally by helping to reduce anxiety and tension; it does this by helping the patient to deal with his problems, by interrupting the vicious circle involving anxiety which is so often present, and sometimes more directly by encouragement, support and suggestion. Clinical evidence would indicate that the effect on the trachea and main bronchi, as described by the Dutch workers, may be of considerable importance in a substantial number of asthmatics, especially in the sort of patient whose wheezing stops extremely quickly once he is put at his ease, and it is a frequent observation that there are patients in whom the wheezing can be, as it were, switched on and switched off during an interview according to the topic under discussion. Using this model, one could argue that one is more likely to be successful in treatment if one sees the patient before changes dependent upon autonomic responses, such as increased secretion into the bronchi, have become established. It is general experience that a substantial number of asthmatic attacks will subside in response to simple psychological measures which may amount to no more than the presence of a doctor who inspires both confidence and tranquillity.

This type of management, which I have characterized as 'the hand-holding technique in the treatment of asthma', may operate through reduction of anxiety, through suggestion, and through the interruption of the conditioned responses, while the pharmacological effects of any drugs given may at

times be less important than their placebo effects. In this connection I have found that a not uncommon source of anxiety is tension between a patient and his doctor on account of the number of prescriptions for refills of inhalant that the patient requires. The doctor may be anxious both because of possible pharmacological dangers, and also because the demand seems out of proportion to the severity of the disease. From time to time one sees patients in whom a sort of battle has developed, which has led in a roundabout way perhaps, to referral to a psychiatric clinic. A clarification of the situation with the doctor and the patient can lead to a considerable reduction in tension, and so to a reduction in the number of refills required. Continuing support is very important after the acute attack has subsided and this means that the patient should feel free to attend when he feels the need; he may then feel less anxious, and may need to attend less frequently.

Suggestion has been used extensively in the form of hypnosis, and was reported on favourably by the Research Committee of the British Tuberculosis Association (1968). Its effectiveness is related to the depth of trance achieved. Black (1969) defines a small sub-group of 5% of the general population as deep trance subjects, and claims that if an asthmatic falls into this group he responds extremely satisfactorily to hypnosis, whereas in the remainder the result will be mostly negative. It is possible that part of the explanation of the success of hypnosis in some patients is that it interrupts a vicious circle.

Following the demonstration of the part played by conditioned responses, behaviour therapy has been used in the treatment of asthma. This has been reviewed by Moore (1965) and recently by Chesser & Meyer (1970). The most commonly used method is systematic desensitization by the method of Reciprocal Inhibition (Wolpe, 1958). The various situations which precipitate or aggravate the asthma are elicited from the patient, and a graduated hierarchy of situations is constructed, ranging from those least likely to produce an attack to those certain to produce one. The patient is taught a method of relaxation, and he is then asked to imagine himself as vividly as possible in the situation of the first item in the hierarchy. As soon as wheezing begins he is asked to relax. By working through the hierarchy the patient learns to face the situations, first in his imagination and later in reality, replacing the asthmatic response by an incompatible one, namely relaxation. This description has, of course, been much over-simplified. In her carefully controlled study, Moore was able to separate the part played by reciprocal inhibition from the effects of relaxation and suggestion, and concluded that it was independent of them and was the crucial factor in the success of the treatment.

In conclusion I would reiterate the value of the joint management of the patient by physician and psychiatrist. 'Mere diet and medical treatment cannot fully cure this disorder . . . when several come together they assist each other to arrive at the desired end, and so the best medical treatment is assured'. (Maimonides).

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