A Lecture
ON THE
INHALATION OF VAPOUR OF ETHER IN SURGICAL OPERATIONS.

Delivered at the United Service Institution, and addressed to the Medical Members of the Institution, on May 12th, 1847.

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If a medical man had been asked, this time last year, whether it were possible to perform a severe surgical operation without the patient's feeling or showing any sign of pain, he would have answered in the affirmative. Such occurrences have taken place in profound insensibility arising from injuries of the head. In a state of imminent suffocation, from inflammation of the windpipe, that tube has been cut open in the throat without the patient being sensible of what was done; and operations might be performed in the deep insensibility of apoplexy and of epilepsy, without the sufferers feeling them. But if any one had been asked last year, whether it would be safe and practicable to induce such a state of insensibility as would prevent the most serious surgical operations being felt, and that without any ill consequences, he would, I think, undoubtedly have considered it an impossibility. Sir Humphry Davy, indeed, nearly fifty years ago, expressed an opinion that nitrous oxide gas might probably be used to prevent pain during surgical operations, but the laughing gas, as it is called, continued to be inhaled in small quantities for amusement only, and the suggestion of Davy was unattended to, at least till recently; for it appears that it was in some measure by following out the researches of Sir Humphry Davy, that Dr. Jackson was led to the recent brilliant, important, and most valuable discovery.

The inhalation of ether for the prevention of pain during surgical operations, was, as all are aware, introduced by Drs. Jackson and Morton, of Boston, U.S., at the end of last year. Another medical man, indeed, in America, is claiming the merit of the discovery, but a little time, no doubt, will suffice to decide to whom the merit is due, or how it should be apportioned. The only way in which I can exhibit the influence of ether on the present occasion, is on animals; they show the effects of it, however, in a very striking manner, and will illustrate what I have to say afterwards.

The ether I pour into this jar is sufficient to make as much vapour as will one-third fill the jar; it is already converted into vapour, and the jar contains a mixture of two-thirds air, and one-third vapour of ether. I have a thrush which I shall put in, just sliding the plate-glass which covers it enough to admit the bird, which will be very quickly insensible. The vapour of ether acts in a very uniform manner on the various classes of animals. The difference in the time they take to become affected and to recover, depends on the difference in the activity of the respiratory and circulating functions. Birds enjoy these functions in the highest perfection, and they are most quickly brought under the influence of ether; they breathe more air in proportion to their size than other animals, and, consequently, inhale the vapour more quickly. This thrush was only in the vapour for about a minute, and it is dead. It had ceased to breathe before I took it out of the jar. It is a result I did not intend, and it has arisen from my going on with the lecture, and looking at my notes, instead of directing my whole attention to the animal. This accident shows the power of the agent, but it does not follow that there is any danger in giving the vapour to a patient; for of course the medical man directs the whole of his attention to what he is doing; he understands his own species better than a bird, and can feel the pulse, and make many observations which I could not on the bird, even if I had attended to it. Besides, the vapour acts much less rapidly on human beings and on quadrupeds than on birds. The large jar in which I am placing this guinea-pig is occupied with an atmosphere of one-half vapour of ether, and the remainder air. It will be quite insensible in two or three minutes—voluntary motion has ceased, and there is no visible movement in it except that of respiration. If I take it out now, I shall probably be able to prick it without causing it to move. That is the case. It now, however, moves its foot on being pricked; it is quickly recovering its sensibility in the air. I shall put it in the jar for a minute longer—it is now deeply insensible, but will recover completely in five or ten minutes.

I shall pour some ether into this dish placed over the water in which you see these gold fishes; I enclose the whole in a bell-glass, and as the ether evaporates, the vapour will be absorbed by the water, and the fishes will breathe it by their gills. They will become insensible towards the end of the lecture, will turn on the side, and exhibit no motion except a slow movement of the gills, and on being put into fresh water they will gradually recover. Quadrupeds of warm blood are affected much less quickly than birds, by vapour of the same strength, reptiles still less quickly, and fishes, which get the air they breathe only at second-hand through the water, are much longer in coming under the influence of ether, and, also, in recovering from its effects.

The same relation of the effects of the inhalation of ether to the breathing, and circulation of the blood, holds good in various individuals of the human species, as well as in different classes of animals. In children, the breathing and circulation of the blood are more rapid than in adults, and children and youths are put sooner and more easily under the influence of ether than persons of the middle period of life, and these again sooner than old people, in whom the respiration and circulation are slow. Children under fifteen I have generally found to become sufficiently insensible for an operation to be commenced on them in two minutes after commencing to breathe vapour of ether, mixed with an equal volume of air; grown-up persons in the middle period of life in three to four minutes, with vapour of the same strength, although there have been exceptions, some of them becoming insensible in two minutes. Elderly people are usually five or six minutes.

The apparatus at first used in America and in this country for the inhalation of ether were glass vessels, and generally contained sponges. They were not provided with any means of regulating the proportions of vapour of ether and of air, and they had a worse fault—that of being cooled by the evaporation of the ether taking place within. The air was cooled in passing through, and took up less and less vapour as the process went on, and sometimes when the patient was on the point of becoming insensible, no further effect was produced, or when seemingly insensible, he was roused up by the surgeon's knife. An opinion began to be entertained, that there were some persons, especially hard drinkers, who could not be rendered insensible by ether; but I believe that no sentient being is proof against its effects, and I no more mistrust the power of the ether than the surgeon mistrusts that of his knife. Several patients to whom I have administered vapour of ether have been habitual hard drinkers, and I have not remarked that there was any difficulty with them. One man who had his forearm amputated by Mr. Cæsar Hawkins, at St. George's Hospital, had been in the habit of drinking a pint of rum before breakfast, yet the operation was commenced in four minutes after he began to inhale, without his showing any signs of feeling it, or remembering anything of it afterwards.

Ether possesses, in an eminent degree, the property of becoming converted into vapour. When in contact with the air, its vapour mixes with, and expands it. The quantity of vapour that will thus mix with the air, increasing with the temperature in a certain geometrical ratio,—the same ratio which the elastic force of the vapour of ether bears to the temperature. The boiling point of the ether most suitable for inhaling is 100°, and this table shows the quantity of such ether that 100 cubic inches of air will take up when saturated with it at various temperatures at a mean barometric pressure of thirty inches:—

Temp. Fahr.	Cubic inches of vapour.	Minims of Ether.
30°	26	28
35°	31	34
40°	37	40
45°	43	47
50°	52	57
55°	62	68
60°	76	84
65°	93	102
70°	115	126
75°	147	161
80°	200	220
85°	284	312
90°	476	523

Thus, at 30°, 100 cubic inches of air take up 26 cubic inches of vapour, and become 126 cubic inches; at about 67° they take up 100, and are expanded to 200 cubic inches; above this temperature, the quantity of vapour increases with enormous rapidity, till, at 100°, it excludes the air entirely. The same quantity of air was introduced into each of these graduated tubes, and into this some ether was passed up, and it has expanded the air to about twice its bulk. As I drop a little ether

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on the muslin which covers the tube, the diminution of heat produced by its evaporation causes the vapour within to be condensed, and the liquid rises till now the air occupies but little more than its original space; but by grasping the tube with my hand, the ether is again converted into vapour, and the space within increases as rapidly as it diminished, showing how readily air becomes saturated with vapour of ether.

By taking advantage of this law, of the quantity of ether-vapour that will mix with air at different temperatures, we are enabled to regulate the proportion of vapour and of air that a person breathes. In order to do this, it is only necessary to bring the air and ether sufficiently in contact, and to regulate their temperature. To do this, I took advantage of the capacity for heat that there is in water, and of the power of conducting it possessed by the metals. By making the inhaler of metal, and placing it in water, the ether it contains, and the air passing through it, are kept of the temperature of the water, which can be regulated by the thermometer. Two or three pints of water supply the heat necessary to the evaporation of an ounce or two of ether, without being much lowered in temperature. The water in which I place the apparatus does not differ much in temperature from the patients' room. In winter I added a little hot water to the cold, but since the weather became mild, that is not always required. The temperature I nearly always employ is between 60° and 70°, and consequently the air and vapour are about in equal quantity. I think it preferable that the air should exceed the vapour, rather than the reverse, and any temperature not lower than 60° I believe to be sufficient. Care should be taken not to bring hot, or even warm, water in contact with an ether inhaler, otherwise the patient will be prevented from obtaining any air with the vapour. Placing the apparatus in a quantity of water prevents the cooling of it by the evaporation of the ether within, and maintains the process steady and equable throughout.*

In order that the inhaler should not stand in the way of the surgeon and his assistants, who want all the room they can get, it is necessary to have an elastic tube between the inhaler and the patient's mouth, and it is of great importance that the tube should be of sufficient capacity. The tube I first used was half an inch in internal diameter, that being the widest to be met with; and wider than those still used with many inhalers: but I found reason to suspect it was not wide enough, and I tried it by breathing through it myself without any ether, and found that I got out of breath in three minutes. The friction of the air against the interior of a tube causes considerable resistance; to obviate this it becomes necessary to have the tube much wider than the windpipe. The elastic tube I always use for the adult is three-quarters of an inch in internal diameter, and by it the patient can fill and empty his chest as rapidly as he likes, without labour. The other apertures, through which the air and vapour have to pass, are not less than five-eighths of an inch in diameter. The spherical valves are of cedar wood, and are therefore very light and easily moved. It is of great importance to take care that nothing of suffocation is blended with the exhibition of ether. Asphyxia, it is true, produces insensibility to pain, as I have ascertained by experiments on animals, but the insensibility of a state of suffocation is painful to produce, is of short duration before it ends either in recovery or death, and is attended with great danger, not only present but subsequent. Partial suffocation is often followed by illness, of which a person may expire in a day or two, but I believe that no such result need be apprehended from ether, if the patient has sufficient air with it. If the animals I have placed in ether vapour have not ceased to breathe before they were withdrawn from it, they have always completely recovered, and been as well as before, however nearly dying they might be when taken out, except, indeed, a bird which was put into oxygen gas, and did not recover.

It is necessary to the success of the process that the mouth and nostrils be carefully closed against the admission of air, except that which comes charged with vapour of ether from the apparatus; for if the air can gain admittance by any shorter method, it does so, and we cannot tell how much vapour the patient is inhaling. An intelligent patient can begin, it is true, by breathing voluntarily just as we wish him, but he loses his voluntary power before he is sufficiently insensible to bear an operation without being roused. I have used different kinds of mouth-pieces, and have only lately got one which fulfils its intention completely. It has been invented and sent to me by Mr. Sibson, of the Nottingham General Hospital. It encloses the mouth and nostrils both, fitting over the bony bridge of the nose, and permitting respiration to go on by the nostrils or mouth, as the patient's wish or instinct leads. This I consider a great desideratum, for the nostrils are the natural channel of the breath, and closing them during inhalation causes apparent uneasiness and struggling in some persons. This face-piece contains flexible sheet-lead in its border, and can be moulded to the peculiarities of any kind of features, and retains the form into which it is moulded. I have used it several times, and have found it to answer completely.

I let the patient begin by inhaling only air, and then turn the two-way tap a little at each inspiration, till the etherized air is admitted, to the exclusion of the other. This prevents the coughing which the sudden access of the vapour occasions in some persons. The air passages rapidly get a tolerance of the vapour, when admitted gradually. I usually get the tap quite turned in a quarter of a minute. I find that consciousness and the power of voluntary motion are soon lost, generally in the first minute, and for some time before a surgical operation could be commenced without causing pain, and awaking the patient. I am aware that different accounts have been given from this, of the effect of ether, and the effect may be different when the vapour is of a different strength, and given in a different manner, but I have stated what I have always observed, from vapour diluted with an equal quantity, or rather more, of air. As the patient gets under the influence of ether, the limbs become relaxed, and drop down, if not supported, but the eyelids still retain their sensibility, and close again on being opened by the finger, but in a little time they cease to do so, or close feebly; the breathing becomes deep, regular, and, as it were, mechanical; and the eyes generally turn upwards, as in sleep. When these phenomena take place, an operation may be commenced, without fear of its causing cries or struggles, or being felt by the patient. I do not always wait for the whole of the above symptoms to show themselves, but take into account, also, the length of time the patient has been inhaling, and the depth and number of inspirations; and I may remark, that I have not once been mistaken, with respect to the time when the operation might be commenced, without causing pain: consequently, an observant medical man will have no difficulty on this point. As soon as the operation is begun, I reduce the strength of the vapour very much, by turning the two-way tap to a certain extent. From what I have observed, I believe that from five to ten per cent. of vapour in the air will keep up insensibility when it is once produced. So I turn the tap till the strength of the vapour is reduced to about twenty per cent., and let the patient breathe this diluted vapour and external air by turns, for a quarter or half a minute at a time, being guided all the time by the signs of returning sensibility, or of deeper insensibility, exhibited by the patient. This I consider preferable to making the patient breathe continuously from the apparatus. Towards the conclusion of the operation, the inhalation should be altogether discontinued. The administration of ether should never be delegated to a non-medical person; consequently, if the operator has no medical assistant, as might happen in a small brig or schooner, which carries but one medical man, he must give the ether to the patient himself, having first got everything ready for the operation, and placed his patient in a position for it. Whilst giving the ether, he must direct his whole attention to it, and when the patient is made insensible, he will have to discontinue the ether, and transfer his attention entirely to the operation. When a person is rendered quite insensible by ether, he will usually remain totally incapable of feeling pain for three minutes, and sensation continues much blunted for some time longer. Now, a great number of surgical operations do not last longer than three minutes, and the most painful part of those that do last longer, is generally over within that time, so that, under these circumstances, the pain would generally be in a great measure prevented. In operations on the mouth, the ether has always to be discontinued before they are commenced, yet the insensibility usually continues till they are completed: this was the case in an operation for hare-lip, in a little girl, to whom I gave the vapour of ether lately.

The pulse is generally accelerated during the inhalation of ether, often becoming very frequent; sometimes, however, it is but little altered. The pupil of the eye, in the earlier cases, frequently became dilated; but I have not observed this since I used the wide tubes, and I am therefore inclined to think that it depended on deficiency of air. There is sometimes struggling as the ether begins to take effect; but

* For a description and an engraving of Dr. Snow's apparatus, see THE LANCET, Jan. 30. In that exhibited at the lecture, there was a two-way tap, and one or two alterations since made.

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this, when it does occur, passes off as the patient becomes totally insensible. During recovery, consciousness and ability to answer questions often returns before the sensibility to pain; and the patient will remark, perhaps, that he did not feel the operation, at the time that it is still going on, if he does not see it.

Common rectified sulphuric ether is unsuited for being inhaled, as it contains alcohol, which would irritate the air-passages. To prepare it for being inhaled, the spirit has therefore to be washed out, by shaking it with water. When so prepared, it has a specific gravity of .720, that of distilled water being 1.000, and it boils at 100° at the usual pressure of the atmosphere. In this state it contains about one-tenth of its volume of water. This water can be separated by carbonate of potash, or by distilling it from quick lime, when its boiling point and specific gravity would be still further diminished; but I consider that it is more suitable for inhalation whilst it contains the water; since, if the air be dry, as it always is in frosty weather, and frequently also, under other circumstances, it will become saturated with aqueous vapour, from the water contained in the ether, as it passes over it, and will thereby be rendered less irritating to the lungs. For tropical climates, also, it is undesirable to diminish further the boiling point of the ether, as it will be sufficiently difficult to preserve it, even when it boils at 100°.

I have found the vapour of ether to succeed completely in preventing the pain in every instance in which I have administered it, and there have been no ill consequences of any kind attributable to the ether. On the contrary, the patients have generally recovered extremely well. The only disagreeable effects of any kind attributable to the ether, have been a little sickness or headach, and this only in a very few cases, although I have given the ether for a great number of operations in private practice, in addition to twenty-eight operations, most of them serious ones, in St. George's Hospital.

The pain endured by the bleeding sailor or soldier, wounded in fighting the battles of his country, is deeply deplored by every feeling mind; and a discovery which can prevent so much of it, as depends on the operations necessary to save his life, must be hailed as a great blessing, if it were for his sake alone; for the pain of a surgical operation is greater than that of the wound itself. Whilst the latter is instantaneous, and its approach unknown, the approach of an operation is seen, and its cuts are necessarily deliberate; and though ever so expeditiously performed, it seems of immense duration to the patient. The blessing would be great of merely preventing this pain, but I am firmly convinced that the exhibition of ether will be attended with the still greater advantage of saving many lives. A great part of the danger of an operation consists in the pain of it, which gives a shock to the system from which it is sometimes unable to recover. If an operation is performed during or immediately after an action, the wounded man suffers two shocks together—that of his wound and that of the operation, which although, singly, his frame might sustain, united, perhaps it cannot. If, on the other hand, a secondary operation, as it is called, has to be performed some time afterwards in the hospital, he is rendered nervous and more susceptible of pain by his illness and suffering. His wonted courage has perhaps been lost with his bodily strength; for the most courageous become often like children in illness, and the operation is looked forward to with dread, and the depression which he suffers from it is great. I believe that ether will give the surgeon a greater choice in selecting between cases for immediate and subsequent operation, for dread of the knife helps to cause and keep up the faintness and collapse, which often prevent the surgeon from operating at once. The ether and its apparatus will not add anything to the necessary baggage, for it will stand in the stead of a much greater weight of brandy. Before the operation, the knowledge of it will supply the cordial of hope. During the operation it will prevent faintness, which arises more from pain than loss of blood, which is seldom great. It usually acts, also, as a stimulant in itself; and I do not remember to have seen wine or brandy given in the operating theatre of St. George's Hospital more than once since January.

This opinion, that ether will save life, as well as prevent pain, is founded on experience; so far, at least, as experience has hitherto extended. Ether has been given in thirty-nine surgical operations at St. George's Hospital, nearly all serious ones; yet only two of the patients died; the remainder either left the hospital well, or are progressing favourably towards recovery; although, besides the two that died, there were one or two others, concerning whom, at the time of the operation, but little hope was entertained of their recovery, the operation being undertaken to give them a slight prospect of cure, without it there being none. I have had the advantage of giving the ether in those of the operations, since the latter part of January, which have been performed at the usual hour for operations, amounting to twenty-eight in number; and I will enumerate such of these as resemble the operations most frequent in the army and navy. Amputations are very numerous in the United Service. Of these there have been twelve—eight of the thigh, two of the leg, and two of the forearm. The two deaths which I mentioned were after amputation of the thigh; they took place some days after the operations. The patients were extremely weak and emaciated at the time they were performed; and I may observe, that two out of eight is below the usual number of deaths after this operation. Operations for necrosis somewhat resemble several undertaken for the removal of bullets and other extraneous bodies. Of these there have been four in the hospital, and the patients did extremely well.

Feigned diseases are a source of great anxiety to medical men, more especially to those of the United Service. It is humiliating to the medical officer, and a loss to the country, for him to be deceived by a man who is only pretending illness; yet to charge with feigning a man who is really ill would be a much more serious error; and the difficulties of distinguishing between real and pretended disease are sometimes very great. Lameness and deformities are diseases that are often feigned. Ether has solved the difficulty in which the medical men were placed in two such instances on the Continent. In one instance a man was suspected to pretend a deformity with projection of the spine. He was put under the influence of ether; his muscles became relaxed, and the deformity disappeared. In the other instance the man was suspected to feign stiffness of the hip-joint; but being rendered insensible, and his limbs quite relaxed, the joint was found to be anchylosed, and of course as immovable as before.

It has been stated in the medical journals, and I have frequently heard it in conversation, that oxygen gas is useful, and is sometimes required, to resuscitate persons under the influence of ether. Now, the trouble and care to be taken in the making of a gas are so great, that if oxygen, or any other gas, were required to remove the effects of ether, this agent would be effectually excluded from the field of battle, and indeed from practice altogether; except, perhaps, amongst the affluent, and the patients of large public institutions; but nothing of the kind is required. I always find that the patients recover their consciousness, and indeed all their faculties, spontaneously, and without delay. I do not find that any means of resuscitation are required; and if they were, I feel convinced that oxygen would not be the agent to remove the real effects of ether. In the beginning of February, I found that oxygen did not counteract the effects of ether on animals. In order to ascertain whether the effects of vapour of ether were due to its excluding, by the space it occupies, part of the oxygen of the air, I supplied, artificially, the oxygen displaced—and even placed animals in oxygen gas, mixed with vapour—and I found that etherization took place quite as rapidly.* I was somewhat surprised, therefore, to find it stated, in March, that oxygen gas was an antidote to ether; and I undertook fresh experiments, and found, that making animals breathe oxygen, after they had been rendered insensible by ether, did not restore them any sooner; that, indeed, they were often longer in recovering; and that one bird, very much under the influence of the vapour, died in the oxygen—an occurrence I never found to take place in the open air. Dr. Gull has arrived at the same result with respect to oxygen given after ether.

I may very properly be asked, how it is that oxygen is reported to have actually been found of service in restoring patients from the effects of ether. I can only explain it by suggesting that such patients are under the influence of asphyxia rather than of ether, since, for a state of partial suffocation, oxygen is an antidote. Inhaling for a length of time, in the way practised with ether, without being allowed any external air, is perfectly new, and the calibre of tubes required for easy respiration in this way is greater than was supposed. But many of the ether inhalers offer such difficulties to the passage of air, by narrow tubes, valves, and orifices, and by obstruction from sponges or ether, that a person could not be made to breathe merely air through them, in the absence of ether, without being put in danger of suffocation in a few minutes.

A great deal that is very interesting might be said with respect to the way in which the vapour of ether probably

* See THE LANCET, Feb. 27th.

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produces insensibility. But I thought it better to confine my remarks chiefly to practical points connected with the administration of it, in order that I might impart, as well as I should be able, to the medical officers of the United Service who might be present, all that I have been able to learn from the experience I have had on the subject; and in so doing, I trust that I have acted in accordance with the wish of the Council.

Hospital Reports.

ST. GEORGE'S HOSPITAL.

REPORTS OF SURGICAL CASES.

STRANGULATED HERNIA; REDUCTION; SYMPTOMS NOT RELIEVED; REDUCTION "EN MASSE"; DEATH; INTERNAL STRANGULATION.

S. R——, aged thirty-five, was brought, April 25th, into the hospital moribund, and admitted under Mr. Tatum. Vomiting and constipation had existed for several days, and there was great pain over the whole of the abdomen, which was much distended. On examination, a small hernia was detected in the right inguinal region. It was flaccid, and was reduced easily, and without the slightest pain, leaving the rings and canal free. There was no pulse at the wrist, and the extremities were quite cold. Brandy and restoratives were administered; but he died shortly after his admission.

From the history of this patient, which was subsequently obtained, it appeared that on the evening of the 21st he had called at the house of a medical man, complaining of sickness and general pain over the abdomen. The pain was, however, not very great, and not increased on pressure. These symptoms were accompanied by constipation of four days' standing, and vomiting, of a dark-green colour, had been present two days. On examining the groins, a hernia was found in the right one. The tumour, of the size of a small orange, was rather tense, and painful when handled. Upon being questioned, the patient attached but very little importance to the tumour, which, he said, had existed for many years without giving him much inconvenience; he had always been able to reduce it, and had never worn a truss. The surgeon reduced the hernia without much difficulty, and then found that the canal and rings were free. Some calomel and a black draught were ordered, and the patient was told to call on the following morning, when he was promised a letter for a truss; but he never made his appearance again until the morning of the 25th, when he crawled into the surgery in a state of extreme depression, and stated that he had taken the medicine which had been given him, but that his symptoms had not been relieved. There was no hernia in the groin at the time, but the abdomen was much distended and painful. He was at once sent to the hospital.

The body, which was examined twenty-four hours after death, externally presented nothing remarkable. In the cavity of the peritonæum, there was a small quantity of serum, tinged with blood and bile. Marks of slight peritonitis existed over the greater part of the abdomen, the convolutions of the intestines being glued to each other, wherever they were in contact, by some slender bands of recently effused lymph. The increase of vascularity was but slightly marked, either in these parts or in the omentum. In the right iliac fossa, and lying close to the internal ring, was a convolution of small intestine, of a very dark-brown colour, and so twisted upon itself, that the passage for the fæces was completely stopped. The whole of this convolution was united to the neighbouring parts by bands of recently effused lymph, which were easily destroyed. After unravelling this portion of intestine, the peritonæum lining the right iliac fossa was found very much thickened and opaque, from inflammatory effusion of long standing. There were also several strong bands, which served to bind firmly to this spot about four inches of the small intestine immediately connected with the cæcum. The portion of gut thus bound down was very much contracted, but without any increase of vascularity in its coats, and it was continuous with that convolution of intestine, twisted upon itself, under which it was lying. In one part the thickened peritonæum, lining the right iliac fossa, formed a thick cord, which was gradually lost on the surface of the hernial sac passing through the internal ring. The dark-coloured portion of intestine, twisted upon itself, measured about five inches in length. Its coats were very much thickened, and of a dark colour throughout, from effusion of blood in and between them; and the mucous membrane, of a dark-green colour, was pulpy, and in a state of incipient mortification. In the part of the mesentery corresponding to this portion of intestine were also several large patches of effused blood. The convolutions of intestine above the twisted portion were very much distended, and slightly inflamed. No other morbid appearances were observed. The hernial sac, which was traced through the rings and canal, was quite empty, and adherent to the front part of the cord in the scrotum; the neck of the sac was thickened and contracted.

STRANGULATED HERNIA; REDUCTION; SYMPTOMS NOT RELIEVED; REDUCTION "EN MASSE;" REPROTRUSION OF HERNIA IN THE EFFORTS OF VOMITING; OPERATION; RECOVERY.

W. H——, aged fifty-six, was admitted into the hospital, under the late Mr. Walker, with symptoms of strangulated hernia, and he gave the following history:—He had been subject to hernia for several years; seven days before his admission the gut came down, and he was not able to reduce it. On the day of its descent he was seized with severe pain in the abdomen, which was shortly afterwards followed by sickness, and there had been no motions since that day. He was seen by a surgeon, who, after some little trouble, succeeded in reducing the hernia; but without any relief to his symptoms, which had gone on increasing in severity. At the time of his admission he complained of great pain and tenderness over the whole of the abdomen, and in the inguinal region; his countenance was very anxious; his hands and feet cold; the pulse hard and frequent; the tongue dry and coated; and the vomit was stercoraceous. After a careful examination of the right inguinal region, a small portion, apparently of gut, was discovered in the canal. He was put into a warm bath, and with very little exertion the tumour in the canal was reduced; but this afforded him no relief, the symptoms of strangulation being still as severe as ever. A question then arose as to the probability of the sac having been reduced with the hernia, and by its neck keeping up the strangulation of the gut. Fortunately, however, during the efforts of vomiting, the tumour suddenly reappeared in the canal, and Mr. Walker proceeded at once to operate. After laying bare the external ring, the sac was easily reached: it was laid open, and in it was found a knuckle of small intestine, of a very dark colour. The stricture was situated at the neck of the sac, and after its division the gut was easily returned. The bowels acted within half an hour after the operation, and the next day all pain about the abdomen had ceased. This patient did remarkably well, and he was discharged from the hospital on the seventeenth day after the operation.

These two cases afford a good example of some of the difficulties which may arise, even after the reduction of a hernia. The reduction of a hernia, with its sac, is, comparatively speaking, an accident of rare occurrence; so rare, that some of our first authorities on the subject of hernia state that they had never met with such a case. Of late years, however, the attention of surgeons having been more directed towards this point, it appears that this accident is not so rare as was at first supposed. M. J. Cloquet's experiments on the dead subject show, that under certain circumstances the reduction of a hernial sac may be effected without any great difficulty; and Ledran, La Faye, Arnaud Scarpa, Sanson, Sir C. Bell, and recently, Mr. Luke, have published cases in which this reduction was effected, more or less completely, during life. Six cases of this kind occurred in Dupuytren's own practice, and five have fallen under the immediate notice of Mr. Luke. In some of these cases the hernia was of recent date, but in others it was of long standing; and in most, the reduction was effected without great force having been made use of. In a practical point of view, the cases of a reduction *en masse* may be divided into two classes: in one class, the hernia has not been completely reduced, and has sometimes been made to reappear during the efforts of vomiting, coughing, &c.; in the second class, the tumour has been completely reduced, and has been found doubled up behind the internal ring, between the wall of the abdomen and its investing peritonæum. The difficulties which may arise in the first class of cases are generally not very great. Most commonly there is some local indication sufficiently well marked to guide the surgeon; and in the operation the reduced sac can be reached without any great trouble; but in the second class, local indications may be but slightly marked, or altogether wanting; and not only have the external ring and canal been laid open, but the internal ring has been freely divided before the tumour could be reached, and the patient's life saved.

Cases of hernia sometimes occur, in which, from various circumstances, there is every reason to believe that a reduction

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