

*On the Discoveries of Jörg relative to the Lungs of Children immediately after Birth.*

ANALYSIS AND OBSERVATIONS. BY DR. GRAVES.

THE interesting investigations of Doctor Jörg were first noticed in March, 1834, in the Dublin Medical Journal, and in September of the same year some account of them was published in the Gazette Medicale de Paris. Doctor Jörg's dissertation appeared in Latin in 1832; since which he has bestowed much attention on the same subject, and in 1835 published in German, the volume whose contents I am now about to notice. Finding confusion had arisen from want of some word to express that state of the lungs in infants, in which portions of these organs are found to have been not at all, or but imperfectly dilated by the air during the time they continued to breathe, he has, in the present work, (entitled *Die Fötuslunge in gebornen Kinde, &c.*) endeavoured to remedy this defect by the use of a new word *Atelektasis*, derived from the Greek, and signifying *imperfect dilatation*.

In order to understand the chain of phenomena which precede and cause the first respiratory act, and to appreciate the nature of the agencies, which, by impairing the energetic action of those causes, give rise under particular circumstances to *Atelektasis*, is the object of Dr. Jörg's first chapter; he there traces the different stages of foetal nutrition and respiration, and shows how the intensity and vigour of both begin to diminish, immediately before the time arrives for the expulsion of the child from the womb. The vascularity and vital energy of the placenta, are thus evidently on the wane, and this organ undergoing a sort of *marasmus*, carries on with decreasing powers the important functions of nutrition and foetal respiration; at the same time, the activity of the amnion declines, and consequently its aid in promoting this object (in whatever way

Digitized by Google

that aid acts) also diminishes. The process of delivery next begins, and uterine pains and contractions follow in their natural order; now it is highly probable, that those pains and contractions exercise a direct influence on the placental circulation, both maternal and foetal, and thus, powerfully tend to interrupt the placental functions, among the rest, that which aerates the blood of the foetus. Here we see a wise provision of nature; one mode of respiration is repeatedly interrupted previously to its being entirely suspended, so that the child labours at the moment of birth under in all the bodily feelings which are coupled with the necessity of breathing, and consequently at the instant where it is exposed to the air, it is impelled by all those feelings, concentrated and acting with the greatest energy, to make a full inspiration. Observe, however, that each preceding uterine contraction, by suspending or diminishing the placental circulation chiefly in the smaller vessels and the circumference of that organ, has prepared the way for the change which now takes place, by lessening the respiratory effects of the placenta on the blood of the foetus. That the uterine contractions accompanying the labour pains, exert a very important influence in thus compressing the placenta, is anatomically necessary. That these contractions operate through the circulation of the placenta on that of the foetus, is *a priori* more than probable; this probability however, is converted into a certainty, by the fact first observed at Berlin, but which Dr. Jörg has not noticed in connexion with this subject, that a notable acceleration of the foetal pulse takes place immediately before the commencement of each labour pain. Now, as the contraction of the uterus commences many seconds, sometimes even half a minute before the pain is felt, we have an explanation of the manner in which this acceleration of the foetal pulse preceding the pain is caused, for we can readily understand why the foetal heart begins to act with greater rapidity, when the pressure on the placenta produces a certain degree of embarrassment in its circulation, and a consequent difficulty in the transmission of blood from the foetus to that organ. This subject has not been yet considered in the light in which the preceding observations place it, and is, I think, well worthy of further examination.

From the preceding observations, Dr. Jörg concludes, that in estimating the physiological effects of labour and the accompanying pains, we must not restrict ourselves merely to the expulsion of the child, and the restoration of the uterus to a state compatible with the mother's safety, but we must consider the act of parturition as acting powerfully, by means of its duration, and the number and energy of the

accompanying uterine contractions, upon the system of the child, so as to prepare it for new efforts necessary for the discharge of the altered functions of respiration; a parturition of the natural duration, gradually checks the placental circulation, and limits that of the foetal chiefly to its own system, while it engenders in the latter, a gradually increasing and finally an urgent want of some new mode of respiration. If the act of parturition be much shorter in duration than is natural, the child incurs the danger of being born in other respects healthy, but not at the moment endowed with the organic stimulus to expand its chest for the purpose of making the first inspiration. The more urgent this stimulus, the more decided and healthful its effects, the more the state of the child approaches to that of asphyxia, suddenly induced in the adult by want of air, as in submersion, the more powerful will be the exertion of the respiratory system of muscles, and the more perfect the dilatation of the lungs by the air at the first inspiration. Once the air, in consequence of this well-performed first inspiration, has penetrated to the air cell in every part of the lungs, the function of respiration proceeds without embarrassment.

Let us now study the effects of this new function on the circulation, in doing which I shall not follow Dr. Jörg, but shall communicate some considerations which I have been in the habit of bringing forward in my physiological lectures. In the first place we must take for granted the great power of the capillaries, and the important part they play in causing the motion of the blood, and co-operating in its progress. It is the capillaries which act in powerfully drawing the blood into limbs in which the main artery has been tied, and to their vital action is owing the final restoration of the circulation; it is to the unnatural action of the capillaries in an irritated part, that is owing the great afflux of blood to that part. Let cold be applied to the hand sufficiently long to weaken and impair the vital force of its capillaries, and immediately, although the great arteries of the hand are as pervious as before, and although they present no obstacle whatsoever to the blood flowing from the heart, and impelled by that organ with its usual energy, immediately I say, the quantity of blood in the hand notably diminishes, the skin becomes paler and exsanguineous, and the fingers, to use the common phrase, *die*; and all this in consequence of the vital energies of the capillaries being impaired by the cold. The capillaries of the lungs play an important part in the pulmonary circulation; the passage of the blood through the pulmonary tissue, from the right side of the heart to the left, is rapid, and as it were unimpeded in the natural state, and during the continuance of healthy respiration; but the moment the latter fails, the moment that

the capillary system of the lungs is impaired in vitality by the contact of blood not properly aerated, that moment do the capillaries begin to forward the circulation through the pulmonary tissue with less energy, that moment commences a gorged state of the lungs, in fact the state which, continuing, terminates by cutting off the passage from the right side of the heart through the lungs to the left, altogether. In the production of asphyxia, the capillaries of the pulmonary tissue are the chief agents, and to the restoration of their vital energy must all our curative effects be directed; here it is vain to endeavour to restore the powers of the heart alone. The *vis a tergo* derived from the right ventricle, will never suffice to drive the blood through the gorged lung; this can be only effected by acting on the capillaries themselves by artificial respiration, which, restoring to them their lost vital energy, immediately draws in, and expels the venous blood.

We are now prepared to understand the important, the paramount importance, which the first act of inspiration exerts on the circulation of the child just born; we are now enabled to comprehend the hitherto unexplained phenomenon, the sudden change in the channels through which so large a body of blood flows; the blood impelled by the combined agencies of the foetal heart, the foetal capillaries, and the placental capillaries, flowed in channels with a velocity and force proportioned to the intensity of these moving forces. What a change now suddenly takes place; the agency of the placental capillaries, at first gradually diminished, now ceases altogether; the circulation through the cord consequently is arrested, and at the very moment that the placental capillaries (which had so long and so powerfully acted in determining the flow of blood to and from that organ to the foetus) cease to exert any influence; an hitherto almost unemployed and still more powerful system of capillaries, that of the lungs, starts into action, in consequence of receiving a new impulse of vitality, a new power from the first inspiration. If we examine the consequences of these alterations, they can be easily traced to their causes, and we can satisfactorily account for the sudden change of vessels through which the blood now flows; we can readily explain why deserting the route of the *ductus venosus*, the *ductus arteriosus*, and the *foramen ovale*, it rushes past its wonted channels, propelled in a new course by the more powerful attraction of the pulmonary capillaries; in fact there is always a system of capillaries interposed between both extremities of the arterial and of the venous trees. The heart is placed in the centre, by its powers destined to maintain the balance of the circulation; at birth the system of pulmonary capillaries is suddenly substituted for that of the placental, and thus a

new disposition of *moving forces* being established, a new direction is given to the blood, which now necessarily flows through vessels hitherto but little used, although fully prepared for its reception—I mean the pulmonary arteries and veins. This much I have thought it right to add, by way of illustrating the physiology of this important epoch in the circulation. We are now prepared to follow Dr. Jörg with more satisfaction, and we can understand the injurious consequences of a too rapid expulsion of the fœtus, for the child then fails to make a full and perfect inspiration, and often breathes not at all for some time after it is born! Hence the channels in which the blood flows are not changed, or are changed but in part, for the change is exactly proportioned to the energy with which the pulmonary capillaries, starting as it were into new life, perform their functions. The two or three first inspirations are the most intense and energetic, for the child then exerts himself under the powerful stimulus of want of breath. When these inspirations have the effect of causing the air to pass into every part of the vesicular texture of the lungs, all is well, and the function is thenceforth performed with vigour; but this is not always the case, and then a portion, often a considerable portion, of the child's lungs remain in their fœtal condition, that is to say, of a brownish colour, and a non-vesicular and consistent liver-like texture; the portions of lung which thus escape the healthful and natural dilatation of their air cells on the first inspiration, are either gradually dilated by subsequent efforts, or else nature failing in the attempt to dilate them in the usual way, tries to get rid of these parts now acting like useless and foreign bodies, and sets up an inflammatory process, often ending in interstitial suppuration, or in vomiceæ; not unfrequently the inflammation gives rise to a complete consolidation of the *atelectatic* parts, which may, when small, be confounded with tubercles, or with minute and insulated hepatizations.

It is obvious that every cause which much weakens the vital powers of the child before its actual birth, may occasion the occurrence of *atelectasis*. Thus may act long continued over violent pressure on the head, hemorrhage from the navel, &c.

Indeed all the causes commonly enumerated as producing asphyxia in newly born infants, may, when they are present only in a slight degree, occasion *atelectasis*. After very easy and rapid, and as they are termed, very lucky deliveries, the child is often observed to be large, of a healthy appearance and form, but nevertheless very weak and unexcitable, although without any of the symptoms of asphyxia; its extremities hang flaccid and powerless; the voice is weak and whimpering; the respiration proceeds as it were in a deficient superficial manner,

and the respiratory motions of the chest, particularly those of its anterior portions, were evidently limited in extent; the eyes remain dull and half open. When such infants are placed in a warm bath, and other stimulating remedies are applied in the usual manner, the debility seems somewhat diminished; the limbs are moved about a little; the eyes more opened; but still the respiration continues deficient and superficial, consisting of a short panting breathing like that of persons affected with the asthma, or with hydrothorax: children, on the contrary, which are born after a very difficult labour, generally exhibit a swollen state of the head, and though they too are often very weak, yet they can be easily distinguished from the former by several characteristic symptoms, such as a red or even bluish tinge of skin, bearing marks of violent compression, and often appearing bruised; such infants often come into the world asphyxiated, and always very weak and exanimated. In many cases indeed they appear already dead, and do not begin to move the lips and chest even feebly for a quarter of an hour or longer after birth; the breathing at first weak and suppressed gradually improves in some few, until it reaches a degree of development compatible with the support of life. Generally their debility is too great, and their respiratory motions continuing limited, they grow worse; their respiration wants the natural depth and regularity, and though it has become continued, is evidently imperfect. They do not utter any loud cries, and at most have a whimpering and weakly voice; their eyes are generally closed and are opened with difficulty, while their limbs seem paralyzed, or are moved at a later period with apparent difficulty: all these symptoms are the more untractable, on account of being occasioned by injurious impressions made on the brain, and which having been of a mechanical and stimulating nature, forbid the employment of exciting remedies. Frequently, indeed, great debility remains even after the consequences of over pressure on the brain have ceased; frequently, too, convulsions take place, depending not upon imperfect respiration, but on previously received cerebral lesions. Sick children of this sort exhibit but slight symptoms of revival when placed in a warm bath; their debility continues, and they speedily fall into a slumber, disturbed by slight convulsive motions; or they lie relaxed and quiet with open eyes. The superficial and short respiration can scarcely be perceived, and the voice remains weak and whimpering. If, on the other hand, premature delivery, excessive hæmorrhage, or any thing else which depresses the powers of life, is the cause of the child's weakness during the first few minutes that succeed its birth, then the symptoms observed coincide entirely with those described as occurring in infants born too speedily.

It may perhaps be possible to discern in what children a connate debility produces the mischief, if they exhibit other proofs of weakness, such as an imperfect development of the limbs and flesh, a deficiency of size and weight, or an evident state of anæmia.

Now although *atelectasis of the lungs* is produced by the operation of different causes in each of these classes, by a want of that stimulus of deficient aeration of the blood, which excites the action of the respiratory muscles in the first class; by a suppression of vital energy in consequence of some passing injury of the brain or spinal marrow on the second; and by a connate want of vital energy, usually the result of premature delivery, in the third class: although atelectasis may originate in causes so distinct, yet once produced, it occasions in all consequences very similar, for it is only in the few hours immediately succeeding the child's birth, that these classes can be clearly discriminated from each other; as the disease proceeds, the pulmonary affection becomes more and more pronounced, and necessarily engrosses all our attention, and the symptoms to which it gives rise are very nearly the same, no matter what may have been the original cause of the atelectasis itself. These symptoms supervene in the course of a few hours after birth, and generally in the following order; excepting obvious debility the infant may appear to a superficial observer in tolerably good health, especially as it makes efforts to suck; these efforts are in general, however, but partially successful; in some a grayish or livid tint may be observed around the mouth for a few seconds, when it fades away again to re-appear after an uncertain interval. In most of the infants a bluish red colour is observable from time to time spreading rapidly over the whole surface of the skin, especially that of the face, and resembling the tint produced by certain stages of asphyxia. The respiration is performed in a superficial manner; the voice scarcely audible, is plaintive; sucking imperfectly performed; sleep either unnaturally prolonged, or else disturbed and nearly altogether absent. In the latter case the eyes not unfrequently remain constantly open, and the body and limbs are scarcely moved. On the second or third day, seldom later, spasms set in, affecting either the muscles of the face or else spreading to other parts; these spasms often amount to fits of convulsions, in which the eye-balls are turned inwards with such force, that the cornea of each eye seems tied to its inner angle; generally the skin is cold and is covered with a clammy sweat; the pale colour of the skin at times changes rapidly to a livid hue, particularly round the mouth and nose, while the nostrils are dilated, as if by a strong effort. The livid colour around the mouth and nose arises

from a derangement of the circulation affecting chiefly the capillaries of these parts, and may be regarded as a pathognomic sign of pectoral disease in children. Sucking is performed very badly, is often impossible, and many children are soon deprived even of the power of deglutition. They very seldom cry, and when they do, the tone of voice is remarkable, being whimpering, hoarse, and even crowing, something like the voice of croupy children; at times a slight pectoral rhonchus may be heard, and they cough a few times in the course of the day. The mouth and eyes generally continue open, and the widened inexpressive pupils are turned almost always in the same direction; trismus, and a remarkable sweating about the head, are occasionally, but not usually, observed.

I have never remarked, says Dr. Jörg, that this group of symptoms proves speedily fatal on their first accession; on the contrary, a certain degree of remission usually takes place; the convulsions diminish in intensity, and gradually disappear; the skin becomes warm; the eyes and head assume a more natural aspect and position; the rhonchus either vanishes or greatly decreases, and the power of sucking is restored; still, however, a well marked degree of debility remains behind, which combined with the remains of the above symptoms, however diminished in intensity, is sufficient to put an attentive observer on his guard, and warn him of the magnitude of the danger.

When proper means, unremitting, and zealously applied, have succeeded in producing alleviation, the second paroxysm is much less violent than the first; the cramps and convulsions, the rhonchus, the dyspnoea, and the hoarseness of voice, return in less than twenty-four hours, but they are less violent and of shorter duration. The skin is not so cold, and the bluish tint which is, as it were, seen through it, is much less intense and more fugitive; the general debility decreases, and immediately after the subsidence of the second paroxysm, the children again take the breast. Should this improvement continue, the power of sucking increases; the child's cries become more natural; the limbs and body are moved with greater ease, and the mouth is closed during sleep, which is tranquil. The longer intervals between the fits and their comparative mildness, encourage our hope of recovery, which are more and more confirmed by the increasing strength of the infant, especially in sucking, and its more perfect respiration.

In children when this affection runs an unfavourable course, matters are very different; after the first paroxysm of convulsions, the debility and listlessness are greatly augmented, the voice remains husky, and a rhonchus in the chest continues, while something like coughing is occasionally heard. Doctor Jörg

says, that the debility in these children is too great, and the respiration is too imperfect to enable them to cough out, as it is called. During the remission, the infant lies with half-open eyes, and enjoys no true sleep, and slight convulsive twitches play about its mouth and upper extremities. In twelve or fourteen hours a new paroxysm comes on of longer duration than the former, and in which it is bereaved of all power of sucking or swallowing, while the skin becomes cold and pale. This paleness, however, often alternates, in the latter accessions, with a livid tinge of the skin over the whole body, while the accumulation of phlegm in the air passages threatens impending suffocation. The eyes are so turned out of their natural direction, that scarcely a segment of their cornea can be seen; the hands are clenched; the toes bent, and all the extremities drawn towards the trunk. The alvine evacuations are very confined, or cease altogether. The attendants are often inclined to think that the child has actually died in one of these fits of convulsions, either of apoplexy or suffocation, for it ceases to breathe for half a minute, or even much longer, and grows so livid and cold meanwhile as really to assume the appearance of being lifeless; after a time, nevertheless, the respiratory motions are again observable, and the pectoral rhonchus is heard louder than before, while every now and then the child draws a deep sigh-like breath. The respirations, indeed, succeed each other at long intervals at first, and are performed so unnaturally, and with such violent spasmodic efforts, that they resemble a snapping or catching at the air. It seems altogether impossible for the little sufferer to live or become better, so long are the pauses between the inspirations, so livid is the body, and so disturbed the features and eyes; the breathing notwithstanding becomes by degrees more continuous, the lividity of the skin diminishes; the heat returns; the eyes are less distorted; and in fine the symptoms all become mitigated; thus proclaiming the approach of another remission. This remission, however, is attended with a more alarming degree of debility and sinking than the former, and with a much less perfect subsidence of the convulsive motions, which indeed continue with more or less violence, while the child unable to suck or swallow, is evidently oppressed with dyspnoea, accompanied by a peculiar attempt at coughing, and a continued rhonchus. The collapse and emaciation are so great, that combined with the extreme pallor, and a glazed eye, they impart to the poor infant's countenance the expression of old age.

It seems now impossible for the child to survive another paroxysm; and yet it often does, and it may even survive more than one, nay, several.

After a shorter remission than before, the third fit commences, with the same symptoms, except that the extreme debility of the child renders the convulsive motions less energetic. Instead of the clonic spasms, tonic are now frequently observed, and the child at the same time that it becomes generally livid, stretches itself out bent backwards in a fit of general trismus; the limbs stiff; the fingers drawn inwards; the mouth shut; and the eyes distorted; after from half an hour to one or several hours have been passed with little rest in this agonizing state of spasmodic suffering, again a remission takes place, but it is of still shorter duration than the preceding; and thus the child at last either sinks exhausted, or dies in a fit of convulsions.

Doctor Jörg is of opinion, that when the disease does not end in perfect recovery or in death, it may give rise to various chronic lesions. Thus all the portions of the lung occupied by the *atelektasis* may become consolidated, so as to lose all traces of their natural vesicular structure, and so they may remain useless, but not injurious, the functions of respiration being sufficiently performed by the rest of the organ; when, however, the *atelektasis* is very extensive, Doctor Jörg thinks that a chronic *morbus cœruleus* or *cyranosis* may be the consequence, and I may observe that the *foramen ovale* must remain open, for the most potent force which operates in diverting the current of blood into another channel, now acts but imperfectly, and consequently blood in proportion to that deficiency must still flow through the *foramen ovale*. In fact I am persuaded that in some cases of *morbus cœruleus* attributed to an open *foramen ovale*, or *ductus arteriosus*, the true cause resides in the lungs, whose capillaries refuse to draw the usual quantity of blood to an organ, but imperfectly qualified for its aeration, and through the capillaries of which organ it cannot be transmitted except it be aerated, as is well proved by the experiments of Alison and others. In such cases nature perceives at once the necessity of still, to a certain extent, keeping open the former passages for the blood.

It is evident, that in many cases the portions of lung occupied by *atelektasis* may run into acute or chronic pneumonia, and in some persons in whom these diseases do not prove fatal, the foundation of a delicacy of lungs, dyspnoea, and shortness of breath may be laid, which may continue for life. In other cases, a constant fever and bronchitis are the consequence of *atelektasis*, but Dr. Jörg confesses, that all these pathological relations of *atelektasis* require a still more extensive and diligent examination of the subject.

*Diagnosis.*—It requires not a little attention and experience

to analyze the various and complicated phenomena that mark this disease; nor is it at first easy to separate the primary from the secondary symptoms. A careful examination of the relation they bear to each other, as to the period at which each first appears, is of great assistance in making this analysis, for we can thus determine with much certainty which is cause and which effect: this observation applies especially to the respiratory and cerebral symptoms. That a considerable portion of the child's lungs remains in its foetal state, undistended, and comparatively solid, (without, however, having undergone the true pneumonic hepatisation,) is most clearly proved by the following group of symptoms: A superficial, short, anxious, at times almost imperceptible, a not unfrequently intermitting and weak respiration; a whining, unnatural tone of voice, diminished power of sucking, and an imperfectly expanded thorax, combined generally with distension of the belly. These, and various symptoms of imperfect aeration of the blood, such as a passing lividity and coldness of the skin, general weakness, &c., sufficiently indicate that the source of the child's sufferings is situated in the lungs. The convulsions, when not produced by cerebral injuries received during labour, are evidently mere consequences of the thoracic affection, and are observed to make their appearance after these, and to be proportioned to their intensity. It is obvious, that unless we have an opportunity of watching the development of the symptoms from the very moment of the child's birth, we will not be able to discriminate with accuracy whether, in such cases, the cerebral affection is primary or secondary; and when we see the child for the first time after all the very complicated symptoms of this disease have supervened, an accurate diagnosis becomes still more difficult, particularly since, as we have remarked above, the original atelektasis may, after a time, originate new lesions, such as bronchitis or pneumonia. Doctor Jörg acknowledges, that at the time he published his valuable work, he was not practised in the stethoscope, and consequently, he cannot from experience point out what assistance that instrument and percussion are capable of giving in the investigation of atelektasis.

*Prognosis.*—It is obvious that much will depend on the prompt application of remedies at the very first commencement of this disease: in fact if instant aid be not at hand when the child is born, but little can be expected; as long as the undistended portions of the lungs remain free from inflammation, we may hope for a complete cure, especially if no very dangerous complications accompany the disease. But when the case is otherwise, and inflammation has once commenced in the portions occupied by the atelektasis, then even an imperfect reco-

very can be only hoped for when these portions were originally of small extent.

*Treatment.*—Much care must be taken to prevent, if possible, the disease from being formed, and the physician must therefore attend especially to the prophylactic treatment. In the first place, we must endeavour to prevent a too speedy delivery, when circumstances give us reason to expect that the process of parturition may prove unusually short. This is to be done by advising the patient to lie as quiet as possible, and to abstain from exerting herself over-strenuously in straining to assist the pains; the aid of mechanical pressure to the abdomen must be likewise avoided, and we must give nothing stimulating internally. In former times, the act of parturition was only regarded as a simple expulsion of its contents by the uterus, and it was thought that the sooner it was accomplished the better; now, however, our views are altered, and we consider this process not merely as one of simple expulsion, but as intimately connected (according to the manner in which it is performed) with the health of the child as well as of the mother.

Every thing that tends to produce unnatural pressure on the head or spinal column must be avoided, and we must be very careful in stopping hæmorrhage from the cord, as any impression of an injurious nature on the nervous or vascular system is peculiarly liable to render the first inspiration imperfect. We must also very carefully remove any accidental obstructions in the mouth or nasal passages, owing to the pressure of mucus, blood, liquor amnii, or meconium.

When the infant is weakly, or but imperfectly developed, in consequence of the dissolute life or some disease of the mother, the supervention of atelektasis cannot be averted without the greatest care and attention, and even the best directed efforts frequently fail; the treatment must in such cases commence at the birth of the child, and must consist of means calculated to stimulate a debilitated frame to a more perfect discharge of the respiratory function. Here the end and the means are peculiarly the same as when a too speedy delivery is the cause of the evil, with this difference, however, that naturally weak or imperfectly developed infants require a much longer continuance of care and attention.

When the proper precautions for averting the formation of atelektasis have not, or have been in vain employed, we must have recourse to remedies whose selection depends on the peculiar exigencies of each case. As the immediate cause of the disease consists in portions of the lung remaining in their fetal condition, undistended by air, we must direct our whole attention to the removal of so injurious a state of things, thereby

preventing both the immediate danger, and the remote but certain ill-effects which arise when these portions of the pulmonary tissue are permanently solidified by inflammation. However energetically we act, we must always bear in mind that the disease may be complicated with pressure on the brain, or straining of the spine, injuries which directly impair the nervous influence necessary for the function of respiration, but which cannot be treated by the application of stimulants meant to excite the injured parts. We must in such cases proceed very cautiously with the means calculated to revive the infant, in order not to push them beyond the proper point, and thus incur the danger of extinguishing the scarcely kindled vital spark by over-stimulation, for here it is not as when we contend with the asphyxia, from mere debility or other causes, where by gaining the first deep inspiration, life is won. Here other evils await us, and even after natural respiration has commenced, death may soon supervene in consequence of apoplectic congestion of the nervous centres.

When the infant arrives into the world exceedingly weak, or when we have reason to suspect the previous application of some degree of violence to the head or spine, we must endeavour to resuscitate it with caution, and in the following manner: In the first place it must be immediately put in a warm bath at 95°, if we cannot succeed in reviving it before the naval string is divided, which, however, should always be attempted, the child being in the bath, and every thing which obstructs the passage of air through the mouth or nose removed, we must rub the soles, palms, and whole length of the spine, diligently with a soft flesh-brush, and we may apply friction either with the hand or a brush to the chest. A little sulphuric ether may be sprinkled on the belly, chest, and back, and may be also cautiously placed in contact with the inside of the mouth and nostrils; the fauces and internal nares may be next irritated with a feather, and we even, when the case seems obstinate, attempt awakening the respiratory energy by introducing some sternutatory powder into the nose. Some recommend us to blow into the nostrils air loaded with stimulating and strong odour, and for this purpose some recommend the practitioner to chew a little garlic; in the meantime cold water may be occasionally dashed with the hand on the abdomen and thorax, and simple water lavements may be used, or else both the water of the bath and that used for the lavements may be quickened by the addition of a little vinegar. If we succeed in thus arousing the slumbering powers of life, we must immediately make a pause in the application of our remedies, in order to avoid the risk of over-stimulation. In general it will be necessary to

resume these remedies in the course of a few minutes, and thus we proceed pausing now and then, but all the while having the pleasure of witnessing the uninterrupted resuscitation of the infant. During this period care must be taken to maintain the bath at a proper temperature, by adding hot water from time to time.

Where some injurious impression has been made upon the nervous centres during delivery, it is useless to attempt artificially inflating the lungs; for the want of vital energy in the respiratory apparatus, produced by the nervous lesion, prevents these organs from performing their proper office, and consequently although the pulmonary tissue may be artificially distended with air, no permanent benefit is obtained; nay, artificial inflation, particularly when pushed too far, may in such cases prove dangerous or even fatal. Doctor Jörg seems to be of opinion, that certain injuries of the nervous system received during delivery, may so impair the nervous energy of the parenchymatous substance of the lungs, that healthy dilatation of the pulmonary tissue, and healthy breathing, are effectually prevented, even although the whole muscular system connected with respiration may make the most violent efforts to carry on this function. This is a very important view, and should not lightly be rejected, supported as it is by a striking case and dissection; indeed I have long been of opinion with Dr. Townsend and others, that the respiratory motions of the extreme bronchial tubes are not merely passive and confined; on the contrary, there is reason to believe that they are active and extensive, and of great importance in the healthy discharge of this function; in fact in some diseases from the beginning, and in almost all towards their fatal termination, asphyxia seems induced not by a deficiency in the motor powers destined to act on the diaphragm, and other respiratory muscles, but by a failure of the nervous energy, which presides over the respiratory motions of the great system of minute air passages. In other words, I believe in the existence of *paralysis of the lungs* themselves.

Our endeavours to resuscitate the infant must be often continued several hours, (during which the child is constantly kept in the warm bath,) before we can hope that the flame of life burns permanently. If the child begins to open the eyes, to move the limbs and lips, if it breathes repeatedly, and even makes attempts at crying, we must immediately dry it, and wrapping it in warm clothing, hand it to the mother, in hopes of its being still further revived by the maternal warmth, or when it can suck, by the natural nourishment.

If notwithstanding our efforts we cannot bring about the

production of deep and strong respiration, and if during the continuance of the asphyxia, a pulmonary affection has been developed, the further mode of treating such cases, must, although their causes are so very different, be precisely the same with that which is proper in infants where the evil depends upon a too speedy delivery, a premature confinement, and consequently unripe condition of the child, an exhausting hæmorrhage, or some mechanical obstruction to respiration; when any one of these causes has produced the state of debility and imperfect respiration immediately after birth, so often referred to, then we must at once employ with the greatest diligence, the means best adapted to remove asphyxia, and excite the respiratory organs to increased action. In such cases, however, our activity and energy are no longer cramped by the apprehension of a cerebral or spinal lesion, and consequently we proceed at once to the employment of the most powerful means, well assured that if we succeed in exciting one deep inspiration, or in causing the utterance of one loud cry, the victory is won.

Inasmuch as the pathological condition arises in the cases before us, from a deficiency in the inward organic instinct which prompts the first inspiration, and from co-existing debility, we must endeavour to stimulate the respiratory organs by those stimuli which excite in them a sympathetic action when applied to neighbouring parts, and by artificially inflating them with air, for the purpose of facilitating their newly awakened efforts. For these reasons benefit is derived from the cold dash applied cautiously to the chest and spine, and from dropping æther on these parts, for if by those means the thoracic muscles are stimulated, they immediately contribute towards the enlargement of the chest, and the lungs now more distended with air, are themselves sympathetically excited to increased exertions, assisted by the application of similar stimuli to the stomach and belly, whereby the action of the diaphragm is increased. *By means of warm baths mixed with vinegar*, while we stimulate the mucous surface, we endeavour to act through the skin with lavements, and the nostrils and the palate with æther, which has, when so applied, a powerful effect on the larynx and air passages. Immediately after birth, on perceiving that the infant's respiration is imperfect, its lungs should be fully inflated, a precaution of the greatest value, as tending at once to bring into operation those portions of the pulmonary tissue which must otherwise become permanently affected with atelektasis. In this operation, however, much attention and skill are required, for if artificial inflation be performed at the moment expiration would have taken place, the

respiratory rhythm is violently deranged, and much risk and danger may ensue. In artificially assisting respiration either by means of the warmth of an adult, or by a bellows instrument, the blowing in of air must be conducted softly and without too great force, and must coincide with the occurrence of the natural inspiration. An instrument is better suited for the purpose, for we can by its means, estimate more exactly this quantity and strength of the current air we force into the chest; this air is purer than that by another person, and consequently is of more value in exciting the lungs to action, and in revivifying the whole system.

Although this plan of treatment may in many prove effectual in preventing permanent atelectasis of any portion of the lungs, yet in violent cases such success is not always attainable, and we may know that we have failed, by observing the symptoms of superficial and difficult respiration, continuing and accompanied too, in the sequel, by signs of derangement in the circulation. This is the moment for attentive observation and for active exertion, for we must be prompt to mark and to meet the symptoms occasioned by the unsubdued atelectasis; to succeed, not merely energy, but the greatest watchfulness and care are requisite. A new set of measures must be now called into requisition; these measures are to commence the moment those already tried in the bath have failed; emetics are here our sheet anchor, in consequence of the powerful influence they produce on the respiratory and circulating functions; emetics seem in such cases to rouse the lungs to increased action, and tend to promote expectoration, an important matter when pulmonary congestion is to be relieved. After the action of the emetic has ceased, Dr. Jörg recommends minute doses of calomel repeated several times in the day, according to its effects upon the bowels and on the disease. The warm bath must be repeatedly used, particularly during the convulsive paroxysms; when the convulsions are violent, a sinapism one inch broad should be placed over the spine at the nape of the neck, and between the shoulders. It is almost unnecessary to observe that all the means hitherto recommended prove useless, unless unremitting attention is paid to maintain the infant at a proper temperature, and unless the most judicious modes of nourishing its system are resorted to. When all these efforts have procured a remission of the symptoms, we must endeavour to improve the advantage gained, by a continuance of the same means, except the sinapisms, which may be omitted; and we must persevere until all traces of the disease have vanished. The frequency of the doses of calomel and of the warm baths, may be diminished in the same proportion; when on the con-

trary, the means above recommended procure no immediate, or but temporary alleviation, they must be continued with greater diligence than before, the doses of calomel and the baths being used more frequently, the former every third hour, the latter three or four times daily; when convulsions are threatened, the sinapisms to the nape must be repeated; when symptoms of suffocative catarrh make their appearance without any evident cerebral complication, they must be met by an emetic, which sometimes averts the more immediate danger, thus giving time for the other remedies, such as the calomel and baths, to produce the desired effect, by restoring the balance of the circulation, and removing the obstruction in the chest. In order still further to promote the cure of the bronchitis, or of the pneumonia when present, Dr. Jörg advises sinapisms to the chest and neck, and in violent cases the application of a single leech.

It is not necessary to detail the observations, however valuable, which Dr. Jörg makes upon the treatment of various symptoms connected with atelectasis, inasmuch as they would suggest themselves to every judicious practitioner; I shall therefore conclude this part of my subject with remarking, that his twelfth chapter, on the connexion of atelectasis with medico-legal investigations, concerning newly born infants found dead under suspicious circumstances, contains much novel and interesting matter.