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A Clinical Essay on the Treatment
of Acute Bronchitis in children.

During the first few years of his postgraduate career there is probably no part of his professional work which so much exercises the mind of the young practitioner as carrying out in detail the fundamental principles which underlie the treatment of disease. Considering, then, that so much thought is devoted to this subject I am tempted to adopt such a theme for this specific purpose; for though as regards the general principles which guide us in our treatment of disease there may be but little difference of opinion, yet in the details of treatment I am persuaded there is a field for enquiry which I trust may be deemed of sufficient importance

to merit consideration at such a time as this. Further, I have been led to select this subject specially, because of the frequent occurrence of diseases of the respiratory organs among the children of the poor - the class of patients which most naturally falls to the lot of the junior practitioner - on account of which a supply of material is provided sufficient to afford every opportunity for testing practically the various modes of treatment which can be deduced from the general principles taught in lectures and textbooks. But while I endeavour to the best of my ability to submit a faithful representation of the facts which have fallen under my notice, I do not wish to be thought, and hope I may not seem to be dogmatic in any of my statements; my sole aim being to record

the result of my experience in the limited number of cases which have been placed under my care, trusting to time and wider experience to confirm or confute the conclusions which I have drawn.

Among the poorer classes the idea is very prevalent that measles, pertussis, digestive disorders and even 'coughs' are essential concomitants of childhood requiring no special medical treatment, and, on account of this opinion, the aid of the physician is seldom requested until a serious complication, or sudden exacerbation of the disease rouses the guardians to a sense of the child's danger. Thus it frequently happens that, in the class of cases the treatment of which I wish to review, we are informed that for several days, possibly for some weeks, the

child has suffered from cough which is usually more troublesome at bedtime and in the early morning, but is accompanied with little or no expectoration, nor, so far as has been observed, is it associated with fever. Such a condition in itself has not been sufficient to cause alarm, nor indeed to attract much attention; yet, in addition, the appetite has diminished, the muscular system has become soft, and the child looks weak and anaemic. For a day or two prior to the case being brought under our notice there has been more distress. The cough is now more frequent, and so troublesome at night that no rest can be obtained. Expectoration is difficult and scanty. The skin is hot and dry; and thirst is very great. The child is restless and irritable, but as a rule makes but feeble efforts to resist examination.

Respiration is hurried and difficult; the alae nasi dilate, the episternal notch sinks, and the sternomastoids stand out prominently at each inspiration. The temperature approaches 103°F , but in a nervous or terrified child may even reach 104°F . On auscultation numerous sibilant râles are heard over every part of the chest wall, and along with these particularly towards the bases of the lungs are a few moist râles. As time goes on, respiration becomes more difficult and chiefly abdominal. The sibilant are altogether replaced by mucous râles which are large and coarse over the sternum and under the clavicles, but much smaller and finer at the sides and backs of the lungs. The skin, which at first was dry, becomes moist. The face is pallid and almost expressionless in character. The tongue is dry and slightly

coated. Minute quantities of liquid, either medicine or nourishment, are swallowed greedily as if the mere act of deglutition afforded some relief to the feeling of suffocation. The head is tossed restlessly, and almost violently from side to side. Expiration consists of short explosions especially when the patient is disturbed. The cough consists of several expiratory blasts, and the expectoration is more or less of a muco-purulent character. The percussion note is resonant in every part, and throughout the illness remains clear at the front and sides of the chest, but occasionally in the later stages of the disease becomes somewhat impaired at the bases of the lungs. As a rule the bowels are regular in action.

The pulse becomes rapid, feeble, and irregular in force. Emaciation makes rapid progress; and if from the onset of the acute symptoms

the treatment has not been carefully and thoroughly conducted a fatal issue may almost certainly be looked for within a week.

Such, then, is a brief clinical description of the cases, the treatment of which is under consideration here; and I may remark at this point, that, while admitting the force and importance of the statement made by Dr. West in his hand-book of Diseases of Infancy and Childhood (7th edition, page 348.) that "Most cases of idiopathic bronchitis that come on gradually developing themselves out of previously catarrhal symptoms have a favourable termination." I can only regard it as being generally applicable to cases occurring in homes where the hygienic conditions are favourable and receiving a due amount of watchfulness and care; for undoubtedly the term "bronchitis" expresses an uncertain

quantity:— the disease varying greatly in degree — and amongst the poor experience tends to shew that most cases of acute bronchitis are extremely dangerous: the inflammatory action passing with great rapidity into the smaller tubules and having for its goal the condition described under the name of capillary bronchitis.

It is to this severer type of the disease — which is certainly to a great extent due to negligence and unfavourable surroundings and but seldom seen in better class practice except as a sequela of measles or whooping-cough — that these remarks are intended to refer.

In the treatment of such a case it must be borne in mind that we have to deal with a child, who, as a rule is weakened by heredity, debilitated by the preexisting catarrhal affection, and surrounded by the most unfavourable hygienic conditions.

Before taking up more fully in detail the different points in connection with treatment, it will perhaps be well to refer shortly to the hygienic arrangements which require to be attended to at the very outset, and which indeed are of cardinal importance in the treatment of the case. In such a class of practice as is here alluded to the kitchen is of necessity the sick-room, and considering the fact that it is used as the sitting-room and dining-room of the family, as well as for all general domestic purposes, ventilation becomes of vital importance. To permit of the purification of what must necessarily be an abnormally vitiated atmosphere by sufficiently large indraughts from the external air with as little discomfort to the patient as possible a little bed is fitted up in any convenient way in close proximity to the

fire-place, and a screen is arranged around it at the sides and head leaving open only the end nearest the fire. We have thus partitioned off from the general apartment a space in which the child lies, and we are now enabled to ventilate the room freely by means of the window and door without the patient being unduly affected by draughts; and in addition, to easily maintain a comparatively equable temperature within the enclosure, while at the same time by roofing in the space and conducting into it steam by means of a tube attached to the spout of a kettle containing water kept at the boiling point, we have practically the 'croup bed' should it be required; and altogether, by such an arrangement as is here indicated, and which in general is recommended in text-books as

one of the factors in the treatment of acute bronchitis, we secure to our patient the best hygienic conditions available under the circumstances.

For the sake of clearness and simplicity the treatment is here considered under three separate headings corresponding with three stages of the disease more or less distinct from one another, and the various points in connection therewith are taken up seriatim.

I The initial stage, or the onset of the acute exacerbation in which the prominent auscultatory phenomenon is the sibilant r le

II The stage of exudation in which moist r les are present in great abundance

III The stage of convalescence in which the moist r les gradually diminish and there is a slow but progressive return to health.

I From the amount of distress and the intensity of the fever it is evident that the degree of inflammation which existed prior to the onset of the acute symptoms has become greatly intensified; and that it has spread in the direction of, and even into the finer ramifications of the bronchi is fully borne out by the future history of the case.

The most distressing symptoms are the dyspnoea and frequent irritating cough which rapidly wear out the child. At this stage of the disease the hacking cough — which only ceases when the patient is thoroughly exhausted, to begin again as soon as the strength is slightly recuperated — is not due to irritation from secretion in the bronchi, which may be removed by coughing; but to the excessive dryness associated with the inflammation, and to give relief our efforts must be directed towards

diminishing the congestion and favouring the discharge of mucus into the tubes. But that we may fully appreciate the value of any method adopted for such a purpose we must be thoroughly cognisant of the prognosis of the case; and more especially must it be remembered that in a later stage there is great danger of collapse of the lungs, a condition which is favoured by excessive secretion and by debility.

With this fully in view it would I think be folly to advocate resection as a possible means of diminishing the congestion in the bronchial tubes; nor indeed would I be favourably disposed towards local bleeding by leeches or cupping in children even as old as eight or nine years, unless it were certain that by so doing the progress of the disease would be stayed entirely; for whatever diminution of blood-pressure results from the hæmorrhage

it is rapidly made up by the conversion of the oligæmia into a hydræmia, (see Coats' Pathology) while the quality of the blood is very slowly improved and in consequence the danger must be greatly increased by the vital depression and debility attending such an anæmic state.

It is a common practice to endeavour to control the inflammatory action by a series of small blisters applied intermittently to different parts of the thoracic wall, and it is hoped that by reflex action and by the increased vascularity of the skin, produced by their application, some beneficial results may be obtained. I have not been able however to satisfy myself that any marked benefit has accrued from this line of treatment, and indeed as regards reflex action it may be doubted if a blister applied to the chest wall will act through the nervous systems

on the lungs beneath. Certainly clinical experience testifies that it does act on the pleura, - especially the costal pleura, - but we know that the chest wall and costal pleura are intimately related as regards their vascular and nervous supply, but no such degree of relationship exists between the chest wall and the lungs; and so we find that while blisters are very useful in Pleurisy, their utility in Pneumonia is very doubtful.

Again as regards the increased vascularity of the skin induced by the application of a blister we know that hyperaemia in one part implies anaemia in another, but since we cannot apply a blister all over the chest wall the hyperaemia derived from the irritation of a small area must be very ineffectual in relieving the lungs; and indeed counterirritants whether applied in the form of blisters or liniments

tend to wear out the patient by the pain and irritation which they induce. On the other hand, still keeping in view the relief of the inflammation by the establishment of a cutaneous hyperaemia, poultices may be applied over the whole of the thoracic wall; and these by their warmth produce a superficial hyperaemia which becomes more general as the heat so applied is diffused over the body, while, unlike counterirritants, poultices by their soothing influence are conducive to rest.

Another manifest advantage is that poultices can be frequently applied - which is not the case with blisters - and so the cutaneous hyperaemia can be maintained. It thus appears that the best local application is the poultice: it stimulates the cutaneous circulation without irritating the child, and depletes the deep organs without depriving the body of its nutrient

fluid. In using this remedy it is necessary to bear in mind that the benefit derived is from the warmth and the poultice should therefore be kept on only so long as it retains the necessary degree of heat; with the fall of temperature its benefit ceases, while by its weight it acts as a mechanical obstruction to respiration. In my experience the best results have been obtained by keeping the poultices on only for half an hour at a time, and applying them every hour in the early stage of the disease; while at the same time steam is discharged into the enclosed space containing the bed, as the inhalation of warm moist air is very useful both in favouring the discharge of mucus into the tubes and facilitating expectoration.

By these means we assist progress towards the stage of exudation, but in addition more direct medicinal treatment is adopted.

Tartar Emetic and Spécacuanha are the drugs most generally recommended, and considered as being specially indicated in this stage, but on account of its depressant effects Tartar emetic is seldom given to young children and Spécacuanha is most generally prescribed. The well known power possessed by this drug of increasing the secretion from mucous membranes is regarded as an indication for its use in these cases. Certainly in the condition which frequently exists prior to the onset of the acute disease which is under consideration here, when, without much apparent distress, there is a wheezing respiration accompanied by a few coarse moist râles; or even in severer cases where only the larger bronchi are affected Spécacuanha may be given with benefit; but in the condition referred to

here, when the inflammation has penetrated into the finer ramifications of the bronchi, when the vitality of the ciliated epithelium is destroyed and we are deprived of the "scavenger" action of the cilia, the sudden superabundant discharge of mucus into the tubes following the exhibition of *Ipecacuanha* seems to me to account for some of the sudden extensive collapses of the lungs which I have observed; and the idea that such a result is due to the *Ipecacuanha* is made more feasible when the influence of frequently repeated doses of this drug is seen to be decidedly depressant, more especially in children, who, even at their best are far from being robust. In many of the cases where *Ipecacuanha* has been used the children have remained almost continuously for hours in a state of nausea, and I am certain that many of these cases would not have assumed so dangerous a character, nor would so many of

them have proved fatal if *Specacuanha* had been withheld. While then, it is extremely desirable and necessary to favour exudation it is still more important to avoid inducing the two most powerful factors which contribute towards collapse - excessive secretion and debility.

Instead of *Specacuanha* I now administer *Tinct. Camphorae Co.* combining it with *Liquor. Ammonii Acetatis* and *Spirit. Aetheris Nit.*

Here although from its influence in checking secretion, and its depressant action on the respiration with the consequent interference with aeration of the blood, *Opium* is contraindicated; yet the minute quantity present in *Tinct. Camph. Co.* seems to me to act in conjunction with the Camphor and the added auxiliaries, more as a stimulant to the circulation and the skin, than upon the respiratory centre, and instead of retarding rather to favour the secretion of mucus in the bronchial tubes.

At any rate, so far as I have been able to judge, the sibilant râle has been replaced by the mucous râle, if not so rapidly at least more safely and more satisfactorily when Tinct. Camph. Co. was given in place of Ipecacuanha, nor did expectoration appear to be interfered with, while the pulse was decidedly strengthened by the former and weakened by the latter; and the benefit of such a conservative mode of treatment is fully appreciated a day or two later, when there is a tendency towards vital depression which frequently becomes extreme, especially if the initial stage of the disease has been combatted with remedies of a depressing nature. Such treatment as is here advocated is maintained until diaphoresis is marked, the temperature lowered, and mucus freely secreted in the bronchial tubes; a condition which is generally brought about within forty-eight hours.

But while we attend to medicinal treatment we must at the same time endeavour to support strength by careful systematic feeding, for which purpose milk, given in small quantities at a time but very frequently, is as a rule, the only form of nourishment necessary during this stage.

II Although the first stage has been of such short duration great inroads have been made on the child's general condition.

Emaciation is particularly evidenced by the sunken eyes and wasted arms and legs. The respiration is still laboured, and moist râles are heard over every part of the chest. We have now entered upon a very critical period, during which, even when to all appearances the case is progressing satisfactorily, there is sometimes a sudden and awful failure of

vital powers due to extensive collapse of the lungs which is rapidly followed by failure of the heart's action.

Throughout the second stage of the disease the treatment has to be specially directed towards the maintainence of strength and the removal of the secretion accumulating in the lungs. To preserve strength the feeding of the patient must be conducted with the greatest possible care and regularity. Digestive power is not often seriously impaired, but should it be, it will be necessary to add to the milk a digestive agent such as Bengers' liquor Pancreaticus or Fairchild's Peptonising Powders. In addition to the milk a little beef-tea should be given occasionally. For little children beef-tea is a valuable cardiac stimulant. I have observed the almost imperceptible pulse of a comatose child become comparatively

strong, full, and steady, after an enema of beef-tea. With the double object, that by its action as a stimulating expectorant the dislodgement of the accumulated secretion may be facilitated, and by its action as a cardiac stimulant the tendency towards passive congestion may be mitigated, Carbonate of ammonia is now substituted for the Tinct. Camph. Co. in the previous mixture. At the same time the froultices are continued but at longer intervals.

Frequently at this stage the mucus is so freely discharged into the bronchial tubes and tubules that dyspnoea becomes urgent, and emetics chiefly of *Spicacuanha* are recommended to be given freely. The object in view is the dislodgement of the mucus from the lungs by the mechanical act of vomiting. It is with diffidence that I take objection to this

mode of treatment, but I only do so after the conviction has been forced upon me that it does not lead to the attainment of the desired object. For though emesis by its mechanical action does dislodge foreign matter or accumulated secretion from the larynx and trachea, it is difficult to imagine that the bronchial tubules are similarly affected. Practically, I have only been able to satisfy myself that after emesis there is a diminution in the number of large coarse râles which are heard over the upper portion of the sternum; and theoretically I am not led to expect much more. In Foster's text book of Physiology 2nd edition page 235 it is stated in reference to vomiting "The nausea is generally succeeded at first by ineffectual retching in which a deep inspiratory effort is made so that the diaphragm is thrust down as low as possible against the stomach the lower ribs being at the same time forcibly drawn in. Since

"during this inspiratory effort the glottis is kept
"closed so air can enter into the lungs, but some
"is drawn into the pharynx and thence probably
"descends by a swallowing action into the stomach.
"In actual vomiting this inspiratory effort is
"succeeded by a violent expiratory contraction of
"the abdominal wall, the glottis still being
"closed so that the whole force of the effort is spent
"as in defæcation in pressure on the abdominal
"contents. The stomach is therefore forcibly
"compressed from without. At the same time,
"or rather immediately before the expiratory effort,
"by a contraction of its longitudinal fibres the
"oesophagus is shortened and the cardiac orifice
"of the stomach brought close under the diaphragm
"while apparently by a contraction of the fibres
"which radiate from the end of the oesophagus over
"the stomach, the cardiac orifice, which is normally
"closed is somewhat suddenly dilated. This

"dilatation opens a way for the contents of the stomach
"which, pressed upon by the contraction of the abdomen,
"and to a certain but, probably only to a slight extent
"by the contraction of the gastric walls, are driven
"forcibly up the œsophagus, their passage along
"that channel being possibly assisted by the
"contraction of the longitudinal muscle. The
"mouth being widely open, and the neck stretched
"to afford as straight a course as possible, the
"vomit is ejected from the body. At this moment
"there is an additional expiratory effort which seems
"to prevent the vomit passing into the larynx"

It seems to me that if by emesis secretion is to be expelled from the ramifications of the bronchi some pressure would require to be exerted upon the lungs. Instead of this being the case however, it appears as if the deep inspiratory effort which is made while the glottis is closed would tend to produce a vacuum in the thoracic cavity, which

would be counteracted only by the drawing in of the lower ribs, so that the lungs instead of being subjected to pressure would rather be less affected by it than normally; and indeed the only element in the act of vomiting which appears to me capable of removing secretion from the respiratory tract is that "additional expiratory effort which seems to prevent the vomit passing into the larynx" and I can only regard this as being sufficient to relieve the larynx and trachea. Yet it must be conceded that even the removal of the secretion from the upper passages of the respiratory tract does relieve the embarrassed respiration, but the same end may be more thoroughly attained by pushing the Carbonate of Ammonia freely with the result that the mucus is removed by coughing; while occasionally as the sputum is driven into the pharynx there is a slight effort at vomiting and so the propulsion of the mucus into the mouth is facilitated, from which it should

be wiped away to prevent it being swallowed.

By depending on cough - by which "the air
" is driven rapidly through the larynx, carrying
" with it foreign substances, liquid or solid, which
" may be present in the air passages" (Lauder
Brunton's Pharmacology page 247) - to remove
the accumulated secretion we avoid the production
of that depression which follows the use of an emetic.

Indeed when *Spicaeanha* was used as an emetic
I have seen the patient thrown for a short time
almost into a state of collapse; while no matter
how rapidly it may act it is reasonable to suppose
that some is absorbed, the depression in consequence
prolonged, the heart enfeebled, and the tendency
towards passive congestion in the lungs and
elsewhere increased.

Early in my professional career I
had the opportunity of seeing many cases of
acute bronchitis in children, and some of

these, in which the respiration was laboured and spasmodic, and in which it was evident that the phlegm was very loose and very abundant, were treated with emetics. In a few of these cases it was noted that the temperature had fallen decidedly below 100°F ., and this fact was considered as an indication that the greatest possible benefit would accrue from the administration of an emetic, as it was argued from the lowness of the temperature that the inflammatory action had abated, and that emesis by removing the secretion would almost at once place the patient in a state of convalescence. The result of experience however hardly warranted any hopeful prognosis, for the mortality among all cases in which the capillary tubes were involved was extremely high, and those in which the temperature had so decidedly lowered invariably proved fatal; and indeed from the consideration

of cases of a similar nature occurring in my own practice, I am inclined to think that the importance of the low temperature was not properly appreciated - that instead of pointing to a cessation of inflammatory action it really indicated that the blood was surcharged with carbonic acid; for in several cases which I have particularly noticed the removal of secretion by free expectoration was followed by an elevation of temperature.

In giving carbonate of ammonia I have found it better to administer it in minute doses frequently repeated, rather than in larger doses at longer intervals, and care should be taken to give it in sufficiently dilute solution, for I have observed a dose of one-third of a grain dissolved in a fluid drachm produce in a child of eighteen months an alarming suffocative attack similar to that which is

induced by the inhalation of the fumes of strong solution of ammonia; while a similar dose in more dilute solution in the same child produced a fit of coughing ending in emesis. In children under two years I give about one-sixth of a grain every hour or hour and a half, prolonging the interval as the urgency of the case diminishes.

Towards the end of the first week, even though the fever may be slight and the secretion considerably diminished, another danger presents itself in enfeeblement of the heart's action. The probability of cardiac failure is manifest even from the onset of the disease, and of itself indicates that all treatment should be consistent with conservation of energy; and indeed cases which have been subjected to any heroic or depressant form of treatment frequently at this stage become very critical, even though they may have escaped all pulmonary complications. To give tone

to the heart one or two minims of Tinct. Digitalis are given along with the Carbonate of Ammonia at intervals of about three hours, while at the same time eight or ten drops of Valentine's Meat Juice are given every hour. Should no pneumonia or other complication occur the heart rapidly regains strength, and by the middle of the second week we feel that the danger is practically over.

III Although the temperature is now normal, and the respiration free, some moist râles continue to be heard for one or two weeks, and great care must be taken to guard against relapse. It is seldom indeed that convalescence is uninterrupted. Occasionally cough becomes troublesome, or a slight febrile condition supervenes and the treatment must be regulated according to the condition of the patient. The state of the bowels must be attended to and

the diet regulated with care. An occasional poultice may be required, but as a rule a stimulating liniment (e.g. Lin. Turbenth. Aed.) applied to the chest and back twice daily is advisable. Expectoration must still be encouraged for which purpose Acid. Nitro-Hydrochlor. Dil. combined with Spt. Chloroform. suits very well. As soon as possible tonics must be exhibited, of which Iron preparations eg. Tinct. Ferri Perchlor. or Sqr. Hypophos. Co. are very suitable. In some cases where debility and cough continue for a lengthened period Cod Liver oil may be given with advantage.

In the foregoing remarks I have endeavoured to convey the impressions which have been derived from a consideration of all the cases, as a whole, which have passed

before me. The seriousness of these cases with the discouraging results of treatment impressed me at an early period; and the results obtained in my later cases seem to justify me in advocating a more conservative mode of treatment than is usually employed, even to adopting in the early stage a method of treatment which might almost be regarded as expectant, and to eliminating any item in treatment which has the slightest tendency to produce depression.