CLINICAL LECTURES

DELIVERED IN

THE OUT-PATIENT DEPARTMENT OF THE
HOSPITAL FOR SICK CHILDREN,
GREAT ORMOND STREET.

By W. B. CHEADLE, M.D., F.R.C.P.,

Assistant-Physician to the Hospital; Senior Assistant-Physician to St. Mary's
Hospital; etc.

II.—HYDROTHORAX AFTER SCARLATINA.

CASE.—*Dropsy after Scarlatina.*—*Hydrothorax.*—*Treatment by Digitalis.*—*Copious Diuresis.*—*Collapse of the Chest-Wall.*—*Complete Recovery.*—*Remarks.*—Frederick C., a large healthy looking child, two years old, first came here three months ago. His appearance at that time presented a great contrast to his present condition, for his lips were bloodless, his face pale and bloated, and his whole body swollen: he was suffering, in fact, from general anasarca. The history given by the mother was, that the child had had scarlatina three months previously, and when recovering from this was again laid up with what the doctor in attendance called congestion of the lungs. The boy had never been well since, and had lately become more pale and puffy in the face. The urine was examined and found to be albuminous. There was stated to be some dyspnoea, but not of any distressing kind, and the chest was not examined. The patient was ordered to take five minims of the tincture of perchloride of iron, with a drachm and a half of infusion of digitalis in caraway water three times a day. This was continued without intermission for fourteen days, at the end of which time the mother brought the child again, and related the following curious story. She did so spontaneously, and without any leading questions being put by me. She stated that the child was in the habit of passing urine in the bed, and that three nights previously the quantity had been so great that it soaked through the blankets and mattress and dripped on to the floor. Such an occurrence had never happened before, and she thought the quantity so extraordinary that I ought to be informed of it. There was another strange thing she had observed with regard to the child to which she wished to call my attention: when she stripped the child for the purpose of washing it on the morning following the night alluded to, she was struck by a curious alteration in the shape of the chest. The left side seemed to have bulged out and become unnaturally prominent in front. The change must have taken place since the previous day, since she was in the habit of giving the child a bath every morning, and also of rubbing oil into its chest, with the object of relieving the difficulty of breathing. The alteration could not, therefore, possibly have escaped her notice. She was much disturbed at the discovery of this deformity, and showed it to her husband on his return home. No other change was observed in the child's condition, except that it seemed more comfortable and slept better.

The boy's chest is now perfectly symmetrical, as far as the eye can judge, although careful measurement still shows a slight inequality between the two sides; but when he was stripped before me then, there was a remarkable difference between the two halves of the thorax in front; the left was rounded and prominent, the right flattened and retreating, especially from the second rib downwards. Very little further examination was required to show that the left side of the thorax was in its natural condition, and not "grown out", as the mother supposed. The chest was deep, and this appearance was the result of the contrast produced by the falling in of the right side. That the deformity was produced by contraction of the right side, and not by distension of the left, was further proved by the fact that all over the left side the respiratory sounds were clear and good, expansion free, and resonance perfect; while, on the right side, breathing was very deficient at the lower part of the lung, both in front and posteriorly: under the clavicle, and near the spine of the scapula, it was bronchial. At the base behind there was dulness on percussion over the lower third; and vocal vibration, which was perceptible enough on the left side, could not be felt there. The heart's apex was beating half an inch to the right of the left nipple, having been drawn over to this extent, with the medias-

tinum to help to fill the space previously occupied by fluid, and not yet reoccupied by the imperfectly expanded right lung. On careful measurement, the left half of the thorax was found to be ten and three-quarter inches round, the right ten inches only. This, you will remember, is the reverse of what obtains in the normal condition, the right half of the chest being usually a little larger than the left. The face was much less puffy, and the urine showed only a trace of albumen. When examined again on August 15th, the child was suffering from catarrh; coarse rhonchi were heard all over the chest. There was still deficiency of breathing and resonance at the base of the right lung, but it was less marked than before. The deformity remained without obvious change; the right side of the thorax was still flattened. On measuring the chest, however, there was now found to be a difference of half an inch only between the two sides. The urine contained no albumen; there was no sign of oedema, and the anæmia had almost disappeared. A mixture containing ammonia and senega was ordered, in place of the iron and digitalis. As the catarrh abated, cod-liver oil and steel wine were given. On again examining the chest, on September 29th, a decided change was at once perceptible. The right side had expanded, so that the difference between it and the left was not very striking at first sight, although seen distinctly enough on looking for it. Good breathing could be heard quite to the base of the lung, although this and the resonance on percussion were not so full as on the left side. The measurements gave the latter 10½ inches, the right 10¼ inches; the difference was reduced to three-eighths of an inch. The patient went into the country at this time and regularly improved, so that, when he presented himself again at the end of October, as far as the eye could judge the symmetry of the chest was completely restored. No visible deformity whatever remained; accurate measurement showed a difference of about one-eighth of an inch in favour of the left side. The respiratory sounds and resonance on percussion were good everywhere, and no difference in these respects could be detected between the two sides.

The account so circumstantially given by the mother, and the physical signs actually observed, reveal very distinctly the series of events which occurred in this case. The child had scarlatina, followed by dropsy, with serous effusion into the right pleural cavity. The effused fluid was reabsorbed, and collapse of the chest-wall followed. The compressed lung gradually recovered its elasticity and permeability, swelled out again to its former bulk, the bulged-in chest-wall expanded, and the right side of the thorax became symmetrical with the left. About these facts there can be no doubt whatever. The child had anasarca and albuminous urine when first seen; and although, when the chest was first examined a fortnight later, and subsequently to the diuresis, there was no large amount of fluid in the right pleural cavity, the presence of a certain quantity there, the collapse of the lung and the chest-wall, and the subsequent complete expansion, prove that the effusion had at one time been considerable. Nor can there, I think, be much question that the principal portion of the fluid was absorbed in a very short space of time. It is possible that a certain quantity might have been taken up gradually, and the resulting space filled by partial re-expansion of the collapsed lung, and some increased expansion of the opposite lung, without falling in of the chest-wall, or with collapse so slight as to escape observation. That the chest-wall should resist the external atmospheric pressure, and retain its form for any length of time after the fluid disappeared, and then suddenly give way, seems impossible, when the flexible character of the ribs in so young a child is considered. If the fluid had disappeared gradually, the ribs would have given way gradually also. That no such gradual sinking in of the right side took place, is satisfactorily established by the mother's evidence. The change must have attracted her notice, in her daily inspection of the child, long before it had reached the extent at which it had arrived when the discovery was made. There can be little doubt, I think, therefore, that the falling in of the chest-wall occurred between one morning and the succeeding one—i.e., within twenty-four hours—and that this was a consequence of the fluid being rapidly absorbed at the same time.

So much seems certain; and there is no reason to doubt the mother's statement, that these events were accompanied by an extraordinary diuresis. Her spontaneous report of it, ignorant as she of course was of any possible connection between the chest-deformity and the flow of urine, is an undesigned coincidence of the highest value as a point of evidence. Now, the coincidence of these two events—the disappearance of fluid from the pleural cavity, and the elimination of an unusual quantity of fluid by the kidneys—might be an accidental coincidence, and nothing more. Yet the two processes could hardly go on together without having an influence one upon the other. If fluid were absorbed as the primary action, its presence in the blood-current in excess would probably excite diuresis, just as we know the entry of fluid into the

blood, when imbibed by the mouth, excites the flow of urine. And, on the other hand, as free circulation through the kidney was restored, and the renal tubes resumed their natural activity, a certain diuresis would ensue. In proportion to the increase in the amount of fluid drawn off from the blood would be the tendency of the vessels generally to take up more, and those of the pleura would be in a condition to respond to the demand, and drink up again the liquid which they had previously poured out.

The dropsy in this case was, no doubt, simply mechanical, the result of an exosmose from the retardation of the blood-current and increased pressure in the blood-vessels, caused by the obstruction to the circulation through the kidneys and the systemic capillaries, and by the stoppage of the ordinary drain from the kidneys. When the obstruction was removed, the pressure would be relieved, the velocity of the blood-current restored, and endosmose would set back into the vessels again.

And here I may remind you that effusions into the pleura occurring in the course of scarlatinal dropsy are of two kinds; viz., those depending upon a mechanical cause—the obstruction to the circulation through the kidney and systemic capillaries—and those resulting from inflammation of the lining membrane. Now there is a striking difference between the two with regard to their amenability to treatment. Simple hydrothorax, dropsy of the pleura, is much more readily removed than effusion resulting from pleurisy: and the reason is intelligible enough. The cause in both cases is indeed temporary, but the condition of the parts after this has passed away is widely different. In simple dropsy of the pleura, which I take to have been the pathological state in the case we are considering, the absorbent properties of the pleural vessels are not injured—at any rate at first; there is no exudation of plastic lymph; the pleura is unthickened, is not coated over, and its vessels are not shut out from contact with the external fluid by a tough coating of false membrane. These changes, so unfavourable to reabsorption, occur in greater or less degree in pleuritis: and then, again, in this, especially when it follows scarlatina, there is the tendency to pus-formation; and pus, you know, will not be reabsorbed, but must be let out by the operation of tapping the chest. But in hydrothorax, the fluid remains serous, and the vessels as fit for their office as ever, prepared to take up the serum as readily as they permitted it to pass out before. Whether, however, the diuresis led to the absorption, or the absorption to the diuresis, or whether (what is more probable) both were to a great extent the normal result of the restoration of free circulation through the kidney and systemic capillaries generally, there is one point which remains unexplained, and that is the extreme suddenness and rapidity with which absorption took place. In the natural course of recovery the changes would be gradual; the kidney-tubes would become free, and resume their functions gradually, not suddenly; the increase of urine would be correspondingly gradual; the absorption of fluid from the pleural cavity, and the falling in of the chest-wall, as the fluid lessened, would be gradual also. We see these slowly progressive changes continually, although collapse of the chest-wall is rare, except as a result of paracentesis. It does, however, occasionally occur as a consequence of simple reabsorption in children, when the ribs are very yielding. It seems, therefore, that there must have been some other power at work in this instance, in addition to the ordinary influence of the restored functions of the kidneys and the accompanying relief to the circulation, which would only come into action slowly, to excite this sudden, rapid imbibition of fluid by the pleural vessels, and the equally rapid evacuation of it through the kidneys. I think that this additional power was exerted by the diuretic action of the digitalis—that it roused into greater activity a process already going on, and hastened its completion. Experiments upon healthy individuals show that the drug does actually increase the flow of urine; and instances are recorded in which diuresis did not immediately follow the administration of the drug, but set in suddenly after it had been taken for some time, as was the case in the present instance. Although, therefore, these cases tend, no doubt, to spontaneous cure, the remedy, if it really were instrumental, as I believe it was, in hastening the removal of the fluid from the pleura, rendered a very signal service. It is of great importance to relieve the lung from the pressure of the effused fluid as soon as possible, before it is permanently injured, for then it expands again more fully and readily, and its return to its former healthy state is more perfect and complete.

I have dwelt upon this one case and its teaching because the facts are very curious and striking, and serve so well for the purpose of illustration. But I believe that the action of digitalis in scarlatinal dropsy in children is almost invariably beneficial, given, as it is usually here, in combination with perchloride of iron. It is followed by steady increase in the quantity of urine, with a corresponding subsidence of effusion. Children bear it remarkably well, and you may give from a

drachm to a drachm and a half of the infusion to a child of from two to three years old for a considerable time with perfect safety; and I have frequently given much larger doses without the supervention of any serious symptoms. I mention the infusion specially, because in my experience it is a far more reliable preparation than the tincture—at any rate, as far as the diuretic action of the drug is concerned. I do not know why there should be this difference, but I believe that it exists, and I have long since abandoned the latter for this specific purpose. You will find, however, that many practitioners, especially those who compound their own prescriptions, as invariably give the tincture. I believe that this preference is founded, however, rather upon convenience than upon an accurate observation of results.

The question of the action of digitalis in renal dropsy is the more interesting and important, because it is almost the only diuretic we can venture to use in such cases; and other means of evacuating the fluid are to be used cautiously, in extreme cases only. The stimulant diuretics, such as turpentine, or cantharides, or squill, which excite hyperæmia of the kidneys, and the two former of which, when given largely, cause such congestion of these organs that the urine becomes bloody and albuminous, are obviously unfit when morbid congestion of the kidneys is the prime source of the mischief we wish to remove. Salines may be of use in aiding the solution and removal of fibrinous plugs in the tubes, but are irritant also, and of very uncertain diuretic action; while most of the vegetable diuretics, such as scopolarium or taraxacum, for instance, if not wholly inert, owe any virtue which they may possess to some stimulating property: both are, therefore, equally undesirable in acute renal dropsy. Neither is it advisable to purge or sweat our patients severely if it can by any possibility be avoided. They are weak and anæmic enough already, and the process is exhausting, and one which young children especially bear very badly. It is better to pass the water we want to get rid of through the kidneys if we can; and we may thus, perhaps, as my colleague Dr. Dickinson suggests, help to flush out the debris of epithelium which chokes the renal tubes.

Now, digitalis appears to serve this purpose thoroughly well; it causes no irritation of the kidney; the urine increases; the albumen decreases under its use, as you may see in the many cases of scarlatinal dropsy usually to be found at this hospital, and treated in this way. How the digitalis does its work, it is not so easy to explain. The difficulty is generally disposed of by the vague statement that it does so not by any direct action on the kidney, but by its general influence on the circulation. Possibly this may be true; but at first sight it is not clear how the effect on the circulation would promote diuresis.

It has now been pretty well established that the effect of digitalis upon the heart is to increase the tonicity of its contractions, and that fatal doses produce death by increasing this effect to a condition of tetanic spasm, so that the ventricles become persistently contracted, the cavity of the heart closed, and circulation altogether stopped. Dr. Dickinson has shown that this drug has also the power of exciting contraction of the uterus; and we might be inclined to assume that it had this effect upon unstripped muscular fibre generally, and upon that of the arterial coats amongst the rest; and thus small doses, by increasing the tone of the vascular coats, would aid circulation through the kidneys, and thus promote diuresis. Against this assumption, however, are the facts, that Dr. Dickinson's observations showed that digitalis had no power in arresting hæmorrhages from parts outside the uterine cavity, as should have been the case if it caused contraction of the arteries; and later experiments by Dr. Nunneley gave negative results. If, however, the recent observations of MM. Legros and Onimus should be confirmed, and the passage of blood through the arterioles be aided by the peristaltic or vermicular contractions of the muscular coat, the failure of digitalis to arrest hæmorrhages would be consistent with an universal stimulating effect upon unstripped muscular fibre generally. Such stimulation of the muscular fibres of the arterioles would increase the peristaltic action, and therefore rather increase than diminish hæmorrhage, until the propulsive power of the heart became affected. The same action would favour diuresis by causing more rapid and easy circulation through the vessels of the kidney. But be this as it may, you will find that digitalis, used in that cautious and watchful manner in which it becomes us to handle so powerful a weapon, with the addition, in the later stages, of iron to remedy the anæmia always present in this disease, will usually prove the most satisfactory and effective remedy in scarlatinal dropsy. To this treatment by drugs must be added a nutritious diet and stringent precautions against cold. You will seldom require to have recourse to further measures, unless such urgent symptoms of effusion or uræmic poisoning should unhappily set in as to call for more active steps, when you may be compelled to attempt the removal of the poisonous material from the blood, or of the fluid from the serous cavities, by purges and the vapour bath.