classical description of the normal movements of the chest in breathing. He says: "During inspiration the clavicles, first ribs, and through them the sternum, and all the annexed ribs are raised. The upper ribs converge, the lower diverge; the upper cartilages form a right angle with the sternum and the lower cartilages of the opposite sides, from the seventh downwards, move further asunder, so as to widen the abdominal space between them, just below the xiphoid cartilage, the effect being to raise, widen, and deepen the whole chest, to shorten the neck, and apparently to lengthen the abdomen. During expiration the position of the ribs and cartilages is reversed, the sternum and ribs descend, the upper ribs diverge, and the lower converge; the upper cartilages form a more obtuse angle with the sternum, and the lower cartilages of opposite sides approximate, so as to narrow the abdominal space between them, just below the xiphoid, the effect being to lower, narrow, and flatten the whole chest, to lengthen the neck, and apparently to shorten the abdomen." I advise you to observe these changes over and over again in your observation of healthy chests, until all their details are familiar to you, until they pass securely into your unconscious cerebration, there to rest as a standard of comparison by which morbid deviations will be revealed to you with unerring certainty, and soon with immediate quickness. You will observe that the movements of the chest wall are made up, in inspiration, of expansion and elevation, and, in expiration, of retraction and depression. In either of the sexes and at different ages there are natural and characteristic modifications of the respiratory movements. In young children inspiration depends mainly upon the contraction of the diaphragm. In them, therefore, the movement of the abdomen is relatively very marked. This type of respiration is named abdominal. The healthy differences between the respiratory movements of a man's chest and of a woman's are marked. In women, the movement of the upper part of the chest in inspiration and in expiration is more obvious than that of the lower portion; in men, the movements of the lower parts of the chest are more apparent than those of its upper portions. The healthy sexual types of the respiratory movements have been named, respectively, the superior costal and the inferior costal. You will further notice that there is nothing abrupt, nothing jerky, nothing laboured, nothing unequal between the play of the two sides of the chest in the healthy respiratory movements. These movements have an ease and rhythm and wave-like flow of their own. The eye can observe no interval between the end of the movements of inspiration and the beginning of the next succeeding movements of expiration. An interval of rest from movement can be seen at the end of each expiration between it and the next succeeding inspiration. This interval is relatively short. If the whole time occupied by a respiratory act and its succeeding pause be represented by 10, the value of the duration of the inspiratory movement may be estimated at 5, of the expiratory at 4, and of the pause between the expiratory and next inspiratory movement at 1. In calm breathing, in health, from 16 to 20 inspirations occur in a minute of time, corresponding to the beats of the heart in about the proportion of 1 to 4. You may notice in examining healthy chests that the impulse of the apex of the heart in its normal position is usually visible. But it is not always so. Absence of a visible cardiac beat is not necessarily a morbid sign.

The possible modifications of the respiratory movements of the chest, which are morbid signs, are numerous. Let us now notice the chief of them in a few general and particular conclusions. You will have observed that the movement of the chest wall in healthy inspiration is a movement in which expansion and elevation are concurrently combined, occurring together at the same time, but in varying proportions, at every part of the thoracic surface. When some portion of lung is increased in solidity, when it is relatively airless, the expansion of the corresponding part of the chest wall is impaired, and, by contrast, the elevation of this part often becomes unusually evident. This is especially obvious upon the occurrence of what is called forced inspiration. Volition may drag the chest wall upwards, but it cannot expand impermeable lung. This elevation of the chest wall, without expansion, or with less of it than is normal, is seen in the infraclavicular region of one or of

both sides in phthisical consolidation of the pulmonary apex or apices. In large-lunged vesicular emphysema the inspiratory expansion of the lungs is less than in health, and inspiratory elevation is seen in relative and exaggerated prominence. Further, there is a healthy balance between the respiratory movements of the thorax and the corresponding respiratory movements of the abdomen, which you must observe and learn to recognise at once. This balance may be upset in disease in the forms of impairment or of excess in either direction. For instance, the thoracic respiratory movements are diminished and the abdominal are increased in pleurodynia and in the early and painful stage of pleurisy. The abdominal respiratory movements are diminished and the corresponding thoracic movements are increased in many diseases of the abdominal contents, in peritonitis, and in painful rheumatic affections of the abdominal muscles and of the diaphragm. These changes are involuntary. To explain them, the phrase the "consensual avoidance of pain" has been used. In many and in various diseases the respiratory movements of the chest are diminished. These movements are diminished in disease, either locally or generally, and in varying degrees of intensity and extent of distribution, according to the position, extent, and nature of the cause, when there is a physical obstacle to pulmonary expansion, as in pleural accumulations, liquid, solid, or gaseous, in consolidation or in emphysematous distension of pulmonary tissue, in obstructions in any part of the air passages, and as in paralysis of some of the respiratory muscles.

The respiratory movements may be excessive when dyspnoea—which is a morbid state which is due to many and varied causes—compels increased respiratory effort to overcome some difficulty in respiration.

When a mechanical and substantial obstruction to the entrance of air into the lungs exists high up in the air passages—namely, in the fauces, in the larynx, or in the trachea—in the form of some morbid product, or as a foreign body introduced from without, a retraction of the lower and lateral parts of chest walls may be observed during inspiration. This form of retraction, under the circumstances I have just sketched for you, is more marked in children than in other persons. In croup the very elastic chest walls of a child may become extremely retracted at the sides, while at the same time the suprasternal hollow is greatly enlarged and the abdominal walls unduly protruded. Again, you will remember the normal duration of the expiratory movements of the walls of the chest as compared with that of the inspiratory movements in each respiratory act. Relatively to that of the inspiratory, the duration of each set of expiratory movements is increased whenever the exit of air from the lungs is impeded, either from impairment of pulmonary elasticity or from obstruction in the air passages.

ON THE DIAGNOSIS OF PLEURAL EFFUSION BY THE ROENTGEN RAYS.

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THAT the Roentgen rays are capable of showing the presence of fluid in the pleural cavity is now a fact beyond question. Not only, however, are the rays capable of revealing fluid in the pleura, they are also equal to the task of showing the composition of that fluid, whether it be pus or serum. The difficulty sometimes experienced in detecting fluid in the pleura, especially in childhood, is acknowledged by all. A method, therefore, by which the shadow of the fluid can be actually seen must obviously be of great use in diagnosis as the following case will illustrate:

CASE I.—A boy, aged 6, was brought to me by my colleague, Dr. Clifford Beale, for an x-ray examination of the chest. The case was an obscure one. There was no heart displacement there was dulness to percussion, with bronchial breathing over the left base behind, but no skodaic resonance was detected. An x-ray examination, however, at once cleared up

any doubt between a solid lung and a pleural effusion. On looking at the skiagraph Fig. 1 (the chest is viewed from the

Fig. 1.

back) we see on the left side a moderately dense uniform shadow, with a well-defined curved margin extending downwards and inwards from near the apex to the articulation of the seventh rib, where the shadow becomes continuous from spine to ribs until it merges into the shadow of the diaphragm. The shadow is not sufficiently dense to obliterate the outline of the ribs, but is sufficiently dense to obscure the outline of the heart, which is not displaced to the right. On looking at the ribs on the affected side an alteration in their normal curve is seen as compared with the opposite side. The ribs have suffered a rotation upwards and outwards. A clear oval space is observed between the well-defined edge of the shadow and the spine, corresponding, no doubt, to the compressed but not altogether airless lung. The diagnosis of fluid in the chest was made. The chest was tapped and 30 ounces of serum withdrawn. Another point worthy of note is that the skiagraph showed no evidence of tubercle. The after-history of this case has quite justified the opinion expressed at the time the chest was tapped, that the effusion was a simple one, and not complicated with any tuberculous mischief of the lung or pleura.

CASE II.—A male, aged 19, was admitted to the City of London Hospital for Diseases of the Chest, with the diagnosis of an empyæma of the right side. On taking a skiagraph of this patient's chest it was at once seen (Fig. 2) that the whole of

Fig. 2.—Chest viewed from the back.

the right chest was occupied by a very dense uniform shadow, completely obliterating the outline of the ribs on that side, and blending with the heart shadow, which was displaced to the left. The chest was tapped and the pus withdrawn. The skiagraph (Fig. 3) was taken after the patient's convalescence. The difference between the two skiagraphs is

Fig. 3.—Chest viewed from the back.

very striking. The heart has returned to its normal position. The right side of the chest is nearly as clear as the left, but not quite, some pleural thickening remaining as the shadow shows; a curved line may be noticed to the right of the X, this corresponding to the track of the sinus, and extending down to the scar left in the chest wall. Again, in this case the skiagraph shows no evidence of tubercle. The patient still remains quite well.

As the above cases illustrate, in doubtful cases of pleural effusion the Roentgen rays will enable us to say if fluid be present or not, and from the density of the shadow to give an opinion as to whether such fluid be serum or pus.

FOUR CASES OF PRIMARY THROMBOSIS OF CEREBRAL VEINS AND SINUSES IN CHILDREN.*

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THE morbid anatomy of hemiplegia of acute onset occurring in children still remains in great measure a mystery. Encephalitis is possibly responsible for some cases, while thrombosis of veins or arteries may be present in others; but *post-mortem* evidence of the existence of either inflammation of the brain substance or of acute affections of the cerebral vessels is small. Even in those instances where the hemiplegia has complicated acute disease of serious nature necropsies are rare. Thus in 30 cases of hemiplegia occurring in diphtheria collected by Thomas,¹ only two necropsies are mentioned. In one there was thrombosis of the middle cerebral artery, and in the other a small hæmorrhage in the lenticular nucleus. In another case of diphtheria recorded by Dr. Edgeworth,² in which I made the necropsy the thrombosis of the basilar artery was present. Sir William Gowers³ has suggested thrombosis of the cerebral veins as a cause of infantile hemiplegia, and quotes a case recorded by Angel Money of such thrombosis occurring after scarlet fever. A case mentioned by Abercrombie⁴ is also sometimes referred to, but that is by no means a clear example of hemiplegia secondary to thrombosis of a cerebral vein. A more suggestive case is one recorded by Handford,⁵ which proves that primary thrombosis

* Read before the Society for the Study of Disease in Children.