

PROGRESS IN PEDIATRICS

RESPIRATORY SYSTEM

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RESPIRATION

Ssokolow¹ has constructed an instrument which he calls a differential pneumograph, by means of which the respiratory excursion of different parts of the chest is registered on a kymograph. Tracings taken from cases are shown and some of these are accompanied by radiographs showing the intrathoracic conditions which were present. By means of the instrument the restricted excursion of one side of the chest in case of tuberculosis of the lungs is graphically contrasted with the movement of the opposite side. Ssokolow² has also described a method of artificial respiration which he has used with success for a number of years in asphyxia of the newborn, and in other conditions requiring artificial respiration. He thinks the method is of more service and less likely to produce mechanical injury than any of the other methods in use.

By means of a specially constructed spirometer, Lederer and Vogt³ investigated the respiratory volume in infants and the effect of certain drugs on the volume. The investigations were carried on during sleep in order to avoid psychic disturbances. They found in infants that the average amount of air inspired in a single respiration is greater in sleep than when awake, but that this difference does not occur in older children. The depth of single inspirations increases from birth on. The amount of air inspired during a period of one minute (Atmungsgrosse) decreases during the first year of life and later remains at an almost stationary figure. The influence of alcohol was investigated, but without any very definite results being obtained. The authors think that their results indicate that alcohol has the tendency to increase the respiratory volume. In cases of chronic lung disease (bronchiectasis) the volume of air inspired was less than in normal children. They found that when the volume of the respiration increases in a normal child, the respiratory rate diminishes. In cases of chronic lung disease, on the other hand, the frequency of the respirations remains the same or even increases when the volume of air inspired is increased.

1. Ssokolow: *Jahrb. f. Kinderh.*, 1912, xxv, 265.
2. Ssokolow: *Monatschr. f. Kinderh.*, 1911, x, 457.
3. Lederer and Vogt: *Jahrb. f. Kinderh.*, 1912, xxv, 1.

Conner and Stillman⁴ studied the respiratory rhythm in meningitis by means of a Marey pneumograph. In all, 43 cases were studied which included 19 cases occurring in infants and 11 in older children. Of the 43 cases, 39 were tuberculous. They noted three types of irregularities: 1. An undulatory type, characterized by more or less rhythmical variations in the force of respirations, and in the tonicity of the respiratory muscles. This was noted at some time in the course of almost every case. 2. Biot's breathing. This was noted in 27 per cent. of the cases, but was more common in adults and in non-tuberculous cases. Biot's breathing shows a constant irregularity in the force and rhythm of the individual respirations, while periods of apnea of varying length occur at irregular intervals. Deep sighing respirations occur frequently. 3. Cheyne-Stokes respiration. This was observed in 19 (63 per cent.) of the 30 cases occurring in infants and children, and was more commonly associated with tuberculous meningitis. In infants and young children Cheyne-Stokes respiration presents certain features which distinguish it sharply from the Cheyne-Stokes respiration of adults. This, which they call the *infantile type*, they consider to be the same as the "grouped respirations" described by West. The peculiarities are described as follows: The duration of a complete cycle (respiratory period and period of apnea) is much shortened—the average time being ten seconds in contrast with the average time of one minute for a cycle in an adult. The number of respirations in each period is smaller, averaging from 4 to 5. The time of the period of apnea is relatively long and occupies one-half of the cycle, while in the adult type the respiratory period is twice the length of the period of apnea. The force and amplitude of the respiratory movements are less, and the gradual increase of amplitude followed by a gradual decrease is not so common. At times all of the respirations have practically the same amplitude in the infantile type.

THYMIC ASTHMA

During recent years the reports of a number of cases of hypertrophy of the thymus which have been treated by the x -ray have appeared in literature. Friedlander⁵ has studied the action of the x -ray on the thymus gland in litters of young rabbits, and has found that involution may be brought about in varying degrees of rapidity according to the number and frequency of exposures. Some reduction in size of the spleen occurs at the same time even when the splenic area is shut off from exposure to the rays. From his clinical and experimental studies Friedlander believes that exposure to the x -rays is a better and safer method of treatment of hypertrophied thymus than thymectomy, as the latter may produce severe metabolic disturbances.

4. Conner and Stillman: Arch. Int. Med., 1912, ix, 203.

5. Friedlander: Arch. Pediat., 1911, xxviii, 811.

In a discussion of thymic death—cases of sudden death occurring in infants or children in which an enlarged thymus is found, although no symptoms of enlargement have been present—Sokolow⁶ takes the position that the enlarged thymus is not the cause of the death except in that it may be a sign of some underlying metabolic disturbance which is itself the cause of the death. That is, there is no such thing as thymic death without thymic asthma, although there is thymic asthma without thymic death. A number of cases are reported of dyspnea with hypertrophy of the thymus, and the author concludes that thymic asthma is a clinical entity due to the pressure of an enlarged thymus on the trachea. A rather unusual cause of enlargement of the thymus was reported by Kennedy,⁷ who found a thymus weighing $2\frac{1}{2}$ ounces in a child dying of cardiac failure. Histologically the enlargement was due to an angiomatous condition of the thymus.

TRACHEOBRONCHIAL ADENOPATHY

Greult⁸ discusses the production, frequency and clinical importance of lesions of the tracheobronchial lymph-nodes. He states that enlargement is by no means always tuberculous in nature, and that marked swelling occurs in pertussis and in typhoid fever. Whether tubercular enlargement is primary or secondary is a question that is not yet definitely decided. The author thinks that even slight compression of the air passages by enlarged glands produces a respiratory murmur which is almost constantly present.

Maillet,⁹ in an interesting, although somewhat hypothetical article, discusses the acute accidents or complications which may appear in the course of tracheobronchial adenopathy. He divides these into respiratory, circulatory and digestive crises. The respiratory crises are the most common and best known and appear in two chief forms, spasm of the glottis and asthmatic attacks. The acute attacks have a sudden onset and last for an indefinite period of time. Clinically the subject of an attack is dyspneic, respirations are rapid and a stridor is present. The stridor may be inspiratory alone, or it may be accompanied by an expiratory stridor. Frequently the attacks are accompanied or followed by bronchitis and congestion, and sometimes by bronchopneumonia. Maillet considers that these acute attacks are the result of pressure of the enlarged glands on the vagus nerve or its branches. The attack may so simulate thymic asthma that it is almost impossible to distinguish the two. The dyspnea, alterations in breath sounds, and area of impaired resonance anteriorly, may be the same in both conditions. Even a radio-

6. Sokolow: *Arch. f. Kinderh.*, 1912, lvii, 1.

7. Kennedy: *Glasgow Med. Jour.*, 1912, lxxii, 31.

8. Greult: *Ann. de méd. et Chir. inf.*, 1911, xv, 497.

9. Maillet: *Arch. d. méd. d. enf.*, 1912, xv, 193.

graph may be unable to help the diagnosis. The author states that the most important clinical sign pointing to enlarged glands rather than enlarged thymus is an area of impaired resonance posteriorly in the area over the bronchial lymph-nodes. Less commonly crises occur in which cyanosis, hemorrhage from the nose or pulmonary hemorrhage, or pulmonary edema occurs, and these attacks Maillet considers the result of vascular compression and calls circulatory accident. Certain cases of vomiting in which no distinctive signs of gastric disturbance are present, but in which the signs of enlarged bronchial glands are found on examination, the author considers as a result of the adenopathy and classifies as digestive crises.

ASTHMA

Knopf,¹⁰ in a discussion of asthma in childhood considers asthma as a symptom-complex rather than a disease *sui generis*. He bases his views on the failure to find any features peculiar to asthma and the lack of an anatomic basis for the condition. He looks on the symptom-complex as a neurosis which has its origin in a congenital weakness and hyperexcitability of the nervous system. Anxiety plays an important part in the etiology. The attacks symptomatically are a faulty coordination in the musculature of the respiratory system, so that muscles which should act as synergists act as antagonists, with the result that the effect of the strong muscular exertion is nullified. It is essential in the treatment to correct the underlying neurotic element and for this purpose it may be best to have the patient in a sanatorium. Breathing exercises accompanied by massage give better results in children than any medicine. In five cases of asthma in children, Knopf has had a symptomatic cure for over a year.

Comby¹¹ has observed 75 cases of asthma in infants and children and gives some interesting figures. The onset of the first asthmatic attack appeared 9 times in the first 6 months of life, 15 times between 6 and 12 months, 32 times between 1 and 3 years, 9 times between 3 and 6 years, and 10 times after 6 years. Of the 75 cases 43 were in boys and 32 in girls. In 21 cases there was a history of asthma in the parents of the child and in 16 cases in the grandparents. It was more common in children coming from families of the better classes, and especially from families with rheumatic or gouty tendencies. Comby looks on asthma in the infant as a manifestation of a neuro-arthritic diathesis, and it is frequently accompanied by other signs of this condition, as migraine. In 28 of the 75 cases there was a previous history of eczema. True asthma is never caused by adenoid growths nor has it any relation to tuberculosis.

10. Knopf: *Ztschr. f. Kinderh.*, 1912, ii, Ref., p. 756.

11. Comby: *Arch. d. méd. d. enf.*, 1911, xiv, 721.

BRONCHIECTASIS

Vogt¹² reports twenty-two cases of chronic respiratory disease in children in which he believes the lesion present to be bronchiectasis and discusses the condition in some detail. In these cases it is usual to find the history of a chronic bronchopneumonia or a chronic or recurrent acute bronchitis. The patients present a picture of general ill health, together with a chronic cough with expectoration. On physical examination areas are found over which râles are inconstantly present and occasionally increased respiratory sounds are heard. If there has been an old pleurisy there may be slight impairment of resonance. The picture is very similar to that of tuberculosis and Vogt believes that this is frequently erroneously diagnosed. It is best distinguished by the failure to find tubercle bacilli in the sputum on repeated examination. In some cases with dilated bronchioles, which have come to autopsy through some intercurrent disease, Vogt has found the influenza bacillus and considers this organism of importance in the etiology. In the majority of cases which follow a chronic bronchopneumonia the dilatation of the bronchi is due to a contraction of the lung with scar tissue formation or to an inflammatory destruction of the elastic and muscular tissue of the walls of the bronchi.

Fisher¹³ considers recurrent attacks of bronchitis to be the most common chronic lung disease of childhood and believes that they frequently lead to bronchiectasis. He thinks that bronchiectasis is frequently a sequel of measles, more so than is tuberculosis. He does not believe that pertussis or enlarged bronchial glands are common causes of bronchiectasis.

Buchmann¹⁴ investigated a number of cases of fetal atelectasis with secondary bronchiectasis in the area surrounding the atelectasis. Clinically these areas can only be recognized through the secondary bronchiectasis. The pleura over the atelectatic areas was thickened and showed a loss of pigment. Numerous muscle fibers were found in the interstitial tissue about the bronchiectatic cavities. No tuberculous lesions were found in the patients examined by the author.

PNEUMONIA

Numerous attempts have been made to produce pneumonia experimentally, but it has never been accomplished with any degree of success until the past year. Lamar and Meltzer,¹⁵ by means of intratracheal insufflation of pure cultures of pneumococci, were able to produce pneumonia successively in forty-two dogs. There was a mortality of 16 per cent., and in the fatal cases the lesions closely resembled those occurring

12. Vogt: *Jahrb. f. Kinderh.*, 1911, lxxiv, 627.

13. Fisher: *Clin. Jour.*, 1911-12, xxxix, 410.

14. Buchmann: *Frankfort Ztschr. f. Path.*, 1911, viii, 263.

15. Lamar and Meltzer: *Jour. Exper. Med.*, 1912, xv, 133.

in man. Clinically the non-fatal cases ran a shorter and milder course than the pneumonia occurring in man. The quantity of the culture seemed to bear a relationship to the outcome of the disease as in the fatal cases larger quantities of pneumococci were used. The authors think that the successful results were due to the obliteration of the smaller bronchi by the injected culture, which permitted the organisms to display their pathogenic activities. Wollstein and Meltzer¹⁶ continued the work, using cultures of streptococci and the influenza bacillus, and produced a lesion resembling the bronchopneumonia of man and differing materially from the lesion produced by the pneumococcus. In the experiments the animals used were not selected, and hence the authors are led to believe that the proper invasion of the organism is the determining factor in the production of a pneumonia. Furthermore, that in all probability different types of pneumonia are produced by specifically different bacteria. Whether or not the degree of virulence of the causative organisms bears a relationship to the type of pneumonia lesion produced remains for future investigation.

Hutchinson,¹⁷ in a discussion of the pneumonias of childhood, divides them into primary and secondary. He defines primary pneumonia as those cases in which the inflammation starts in the lung substances, and secondary as those in which it starts in the air passages (bronchopneumonia). Primary pneumonia may be lobar or lobular in its distribution and is practically always due to the pneumococcus. Its maximum incidence as regards age is between 1 and 2 years. The onset is usually abrupt, although often deceptive, as an attack may be ushered in by vomiting or simply drowsiness of the child. Fever and shivering may occur and convulsions are not uncommon, but a true chill is unusual. Very characteristic is the altered respiration—increase of rate frequently out of proportion to the pulse, with inversion of the respiratory rhythm (pause after inspiration). The physical signs are often absent in beginning pneumonia in children, and rarely the signs do not become manifest until the crisis is past. Impaired resonance is an important sign, and in obtaining this Hutchinson urges the value and necessity of using very light percussion. The symptoms are usually less pronounced in children than in adults, as children do not seem to suffer so much from the toxemia. Heart failure is a rare occurrence in childhood. As a rule primary pneumonia terminates by crisis on the seventh or eighth day, but it is not infrequent to have pseudo-crises. In these, however, the respiratory rate does not fall as it does in the true crises. After a crisis it is not uncommon to have an unstable temperature in children. Persistent cases may be due to protraction or there may be a spreading

16. Wollstein and Meltzer: *Jour. Exper. Med.*, 1912, xvi, 126.

17. Hutchinson: *Chn. Jour.*, 1912, xxxix, 289.

or relapsing of the primary focus of inflammation. The prognosis usually is good, and the author summarizes his treatment by saying that his cases "get really nothing which can be described as treatment at all, and I find that they do very well without it."

Niles and Meara¹⁸ report a case of lobar pneumonia in a boy of 14 years, which was due to infection with the *Micrococcus catarrhalis*. Blood cultures and cultures from a pleural exudate were sterile, but pure cultures of this organism were obtained from the sputum. Trevisanello¹⁹ obtained pure cultures of Fraenkel's diplococcus from herpetic lesions in two cases of pneumonia. Implantation of the organisms on the skin of another patient produced an herpetic eruption. The organisms were of low virulence, but the author thinks they may be capable of infecting susceptible individuals.

A case of probable antenatal pneumonia was reported by Macdonald,²⁰ the history of which was as follows: On the 17th of the month a woman at term was admitted to the hospital suffering with pneumonia. Two days later she gave birth to a female infant weighing 6 pounds. The baby was cyanosed, but cried shortly after birth. All that day the infant had difficulty in breathing and died twenty-eight days after delivery. At necropsy the upper and lower lobes of the right lung were found in a stage of red hepatization, and from the lesion cultures of pneumococci were obtained. The author thinks that from the advanced stage of the lesions found the infection must have occurred through the placental circulation before birth.

By means of a Faught sphygmomanometer, Howland and Hoobler²¹ determined the effect of cold fresh air on the blood-pressure of children with pneumonia. When children with an active pneumonia were taken from the ward and exposed to cold air on a balcony there was a rise of blood-pressure, and return to a warm, although well ventilated ward, was followed by a fall. The rise is usually noticed about a half hour after the child is put out of doors, reaches its maximum in two hours, and is maintained for a number of hours afterwards. In convalescents the change in blood-pressure was less striking and in some cases did not occur. In warm weather no effect is obtained by putting the children out of doors, and hence the authors think that the coldness of the air is the important factor, and that its action is by a reflex stimulation of the vasomotor centers through the action of the cold air on the skin and nasal mucous membrane. Whether it is advantageous from the standpoint of the circulation to raise the blood-pressure of a child with pneumonia, whose blood-pressure is already at an average point, the authors are not

18. Niles and Meara: Amer. Jour. Med. Sc., 1911, cxlii, 803.

19. Trevisanello: Centralbl. f. Bakteriol., 1 Abt. Orig., 1911, ix, 69.

20. Macdonald: Brit. Med. Jour., 1911, ii, 1247.

21. Howland and Hoobler: AMER. JOUR. DIS. CHILD., 1912, iii, 294.

prepared to state. No bad effects were noted. The other beneficial effects of cold fresh air are not discussed in the paper.

EMPYEMA

In an article on the diagnosis of pleuritic effusions in infancy, Miller²² draws attention to the fact that practically all pleural effusions in infancy are purulent. They are never primary and most commonly follow pneumonia. The general symptoms of a child with empyema are marked, but the physical signs are indefinite and variable. Vocal fremitus is of little value. Dulness on percussion is not always present. Bronchial breathing and râles are usually heard over an effusion. Exploratory puncture is the decisive and only sure means of diagnosing a pleural effusion. Next to this come dulness and a sense of resistance on percussion and displacement of the apex.

Zybell²³ reports 22 cases of empyema occurring in the first year of life and reviews the literature. In 14 of 20 cases examined the pneumococcus was found. Only 4 of the 22 cases were admitted to the hospital for pneumonia, but in practically all the pleural effusion was preceded or accompanied by pneumonia. He also considers exploratory puncture to be the most important and often the only useful means of diagnosis. The prognosis of empyema in infants is bad, and 15 of the 22 infants died. The cases which recovered were all among the older infants. In a discussion of the treatment Zybell is strongly in favor of aspiration or repeated puncture with a good sized cannula. He is opposed to a radical operation in infants (resection of a rib) and quotes a number of statistics to show that with resection the mortality is higher than in cases treated by aspiration or puncture. Kelly,²⁴ while in favor of drainage with children, notes that previous aspiration may be of benefit, and that in very young or very feeble infants simple incision under local anesthesia is better than resection of a rib.

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22. Miller: *Arch. Pediat.*, 1911, xxviii, 28.

23. Zybell: *Monatschr. f. Kinderh.*, 1912, Orig. xi, 93.

24. Kelly: *Amer. Jour. Surg.*, 1912, xxvi, 47.