A REVIEW OF THE EPIDEMIC OF INFLUENZA AT THE BASE HOSPITAL, CAMP BEAUREGARD, LA., WITH SPECIAL REFERENCE TO SYMPTOMS AND SEQUELÆ.

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THE epidemic began September 21. Cases began to be sent in to the hospital on September 24.

TABLE I.

	Numbers.	Cases of influenza.	Died.
Troops stationed here	15,000	7500	427
Personnel of Base Hospital	610	327	4
Nurses in hospital	300	152	2
Soldiers in 5th Infantry	3,200	2600	125

This table gives some idea of the way the Camp, as a whole, and different organizations were affected. The Fifth Infantry was more severely attacked as the epidemic first appeared there, and the disease was most virulent in the beginning. Of the command approximately 50 per cent. had the disease. Of the 7500 cases of influenza, 1474 developed pneumonia, or 19.6 per cent. Of these 1474 cases of pneumonia, 427 died, a mortality of 29 per cent.

We have placed the period of the epidemic from September 24 to October 18, 1918, as since the latter date admissions have been normal. A good many of the complications and sequelæ here recited have stretched over a longer period.

Charts I and II give salient features of the epidemic. Chart I shows the patients in hospital day by day and Chart II the daily admissions, including pneumonias in hospital as reported (not as they appeared) and deaths day by day.

THE DISEASE. A special report is made in the paper by Capt. McClelland on the bacteriology of the cases of influenza and the pneumonia cases following the influenza. On the day that the first case appeared in the hospital we realized the enormous amount of work that would be thrown on the laboratory staff by such an epidemic, so the commanding officer asked the laboratory men of the different organizations mobilizing here to come into the laboratory and immediately take up the task with Capt. Henderson, of working out the etiological factor of the epidemic. Their work has been of wonderful value and satisfaction to us all.

As is shown in their report the etiological factor was the influenza bacillus and the disease a true influenza.

The symptoms were of exceeding variety as to severity and kind. Most of the cases had severe backache, headache, a racking cough, flushed face, injected eyes, and, as a rule, a pulse between 80 and 100, with a temperature from 101° to 104°. Most all of them were dull and apathetic, went to sleep in the ambulance, slept on the litter while they were being carried into the hospital and had to be

aroused to answer questions. They only roused up to cough, take medicine or nourishment. They all looked prostrated and sick. All slept twelve hours, some sixteen to twenty-four hours. The fever and prostration in the mild cases lasted forty-eight hours, the

CHART I.—Patients in hospital day by day.

CHART II.—Daily admission, showing pneumonias in hospital as reported and deaths day by day.

patients then began to get up and sit on the edge of the beds. They were all weak and some fainted in trying to get out of bed. The more severe cases had fever for three or four days. Practically all cases that had fever longer than this proved to have broncho-pneumonia. Many had vomiting; some became tender over the

abdomen, imitating an intra-abdominal condition. (See Appendix I for a typical case, Chart 3.)

There was a leukopenia in practically all cases and no rise of leukocytes with the advent of pneumonia.

Besides the ordinary symptoms, a striking feature in the early stages of these cases was the bleeding from some portion of the body. Our statistics show that 15 per cent. suffered from epistaxis. Everywhere one went he saw men with bleeding or packed noses. Fifty cases of subconjunctival hemorrhage were counted. Twelve had a true hemoptysis, bright red blood with no admixture of mucus. Six cases vomited blood. One case died from loss of blood from this cause. Among the nurses, menstruation began in about 80 per cent. two or three days after going to bed. Three cases had intestinal hemorrhage. Most of the bleeding came early, with the exception of three cases of hemoptysis, which came after bronchopneumonia had begun.

Twelve to fifteen per cent. of all cases had herpes either of the lips, tongue, nose or mouth, the eruption being exceedingly extensive in some cases.

Pneumonia developed secondarily to the influenza in 1342 cases, and the complications given below must be regarded as complications of this disease, in most cases, rather than influenza.

Jaundice of a mild or severe degree developed in 112 cases of bronchopneumonia. In those recovering the jaundice disappeared very rapidly, in some cases clearing up entirely in seven or eight days. The liver in all cases seen was enlarged, so we believe it was a true cholangitis.

Otitis media has been reported in 41 cases. Fortunately the otologists were on duty day and night and did immediate paracentesis on all bulging drums. No mastoid operations so far have been necessary.

Infectious psychoses were seen in 18 cases, the patients exhibiting all grades of aberration from simple transient hallucinations to maniacal frenzy which needed mechanical restraint for twelve to twenty-four hours. Two of these cases have not cleared up at this date, one being free of all other signs and symptoms for four days; the other still having signs of his bronchopneumonia.

Two cases developed an hysterical aphonia (which cleared up in three and eight days respectively).

Five cases of pneumococcus meningitis were diagnosed clinically and proved positive by lumbar puncture; 6 to 8 cases were punctured that had some signs of meningitis; these all showed a clear fluid under pressure, no increase in cells and no bacteria.

Eleven cases of epidemic cerebrospinal meningitis were diagnosed and isolated during the epidemic; 3 cases developed after the patients were convalescing from pneumonia and had been in the hospital from three to four weeks. Report of this will be made later.

Cases with a friction rub were of such common occurrence that

we have not been able to give any reliable statistics as to numbers on them.

Empyema cases have appeared at the end of the epidemic. Twenty-nine have been reported so far, 3 cases showed hemolytic streptococcus, 20 cases pneumococci, 7 cases no organism found.

The most interesting complication on account of its usual rarity has been interstitial emphysema, of which we have had 10 cases. Histories of the first case, with picture by Capt. A. L. Levin, and one of the two cases that have lived are hereby appended. (See Appendix I.) Also an autopsy report by Capt. Schultz on one of the cases. (See Appendix II.) The only reason that can be given for the great number of these cases is the violence of the cough and the degenerative changes brought about in the disease. All of these cases had influenza, followed by bronchopneumonia, the subcutaneous emphysema coming from six to ten days after the beginning of the disease. The air was first felt in all cases in a collar about the neck and then gradually spread over the back, chest and arms to the hands as far as the knuckles and down the thighs to the middle. A rupture of the bronchus at the root of the lung seems to us the only explanation.

Two cases after violent coughing developed a pneumothorax, the heart being pushed to the right as far as the midline on that side. (For autopsy on one case see Appendix II.) One case has proved to be a pyopneumothorax.

Capt. Levin presents a brief history and autopsy findings in one of the most remarkable cases of the epidemic, gangrene of the colon with rupture. (Appendix I.)

Briefly, in this paper, we have given the unusual complications in this epidemic. Unfortunately, we did not have the time or the facilities for doing some of the work that should have been done.

We can give no reason for the frequency of hemorrhages, but cannot help feeling that there must have been some definite change in the constituents of the blood, although we made no estimation of the coagulation and bleeding time nor counted platelets.

The effect of the influenza bacillus must be to prepare a fertile field for the pneumococcus, as we have never seen such virulent pneumonias either primary or secondary to measles. Death came rapidly and could be prognosticated practically from the moment the man entered the hospital. The object of this paper and appendices is to put on record for further use the disease as we have seen it. This should be worth while.

APPENDIX I.

CASE I.—Case of influenza; no complications.

Reg. No. 23,718. M. J., Pvt., Co. C, Dev. Bn. Admitted October 23, 1918. *Family History* and *past history* not important. *Present Illness.* Onset sudden, with aching over the whole body and pains in the head and cough.

Examination. Signs of a bronchitis. Sputum shows *Bacillus influenza* and Type IV pneumococcus.

Blood Count. Whites, 5000; polymorphonuclears, 48 per cent.

Urine. Negative. (Chart III.)

CASE II.—Case of interstitial emphysema bilateral (died).

Reg. No. 19343. C. J. R., white, aged twenty-three years. Native of Louisiana, carpenter, robust physique. Four months in service. Onset of influenza September 23, 1918. Admitted September 24, 1918. Symptoms of influenza. Diagnosed: Bronchopneumonia at base of right lung on September 30, 1918. Coughed

FIG. 1 (Case II).—Showing bilateral interstitial emphysemas.

violently when temperature lowered; cautioned about it. Began to improve when subcutaneous emphysema developed at 3 P.M. on October 6, 1918. Died at 10 A.M., October 8, 1918.

Past History. Malaria, treated at Base Hospital.

Diagnosis. Interstitial emphysema bilateral.

Result. Death. (Fig. 1, Chart IV.)

CASE III.—Case of interstitial emphysema (with recovery).

Reg. No. 22920. H. N., Pvt., Co. K, 5th Infantry. Admitted to hospital October 5, 1918. Diagnosed: Bronchopneumonia October 8, 1918.

October 12. Became delirious and unmanageable.

October 13. Subcutaneous emphysema developed over the left

CHART III.—Clinical chart of Case I, uncomplicated case of influenza.

CHART IV.—Clinical chart of Case II. Fatal bilateral interstitial emphysema.

chest, left arm and hand. Same day developed a tremor over the whole body; eyes wild and staring; talks incessantly.

October 16. Patient wants food; lungs better.

October 20. Emphysema practically disappeared except under left clavicle.

October 28. Practically well; chest clear; emphysema gone. (Chart V.)

CASE IV.—An unusual complication of bronchopneumonia, Type III.

Reg. No. 23476. C. C., Pvt., Co. G, 29th Infantry. Miner by occupation. Three and a half years in service. Admitted October 9, 1918, with influenza. Bronchopneumonia detected on October 11, 1918, left lung, Type III sputum and blood culture.

October 18. Marked abdominal distention noticed (upper abdomen).

October 10. Purulent pleural fluid obtained; culture: pneumococcus, Type III. Plastic pneumococcus peritonitis suspected on October 20.

October 23. Distention relieved.

October 25. Pus obtained from left chest. Operated on the same evening, 9.30 P.M. Dyspnea, cyanosis, collapse. Died 11.50 P.M.

October 26. Autopsy: Plastic pneumococcus peritonitis, rupture of transverse colon the entire length; gangrenous, fecal matter freely in pocket. Transverse colon eight inches in diameter; small and large intestines agglutinated.

APPENDIX II.

Autopsy Protocol, No. 1.

Name: E. V.

Autopsy No. 6.

Rank: Sergeant, Co. E, 5th Infantry.

Time of death: 2 A.M., September 28, 1918.

Time of autopsy: 9 A.M., September 28, 1918.

Admitted: September 26, 1918.

Clinical Diagnosis. Lobar pneumonia, right lower.

Anatomical Diagnosis. (1) Acute catarrhal bronchitis; (2) diffuse bronchopneumonia of both lower lobes; (3) acute hemorrhagic pleuritis of right lung; (4) acute splenic tumor; (5) cloudy swelling of liver, kidneys and myocardium.

External Examination. The body is that of a well-developed, white male, about seventy-one inches long, weighing about 185 pounds. Strong rigor is present, and there is marked lividity of the posterior surface of the body and of the left side of the face. There are no external marks of injury or of identification.

Internal Examination. A thin layer of subcutaneous fat is present. The peritoneal cavity is free of adhesions and of fluid. The pericardial cavity contains a slight excess of fluid which is partly clotted. The left pleural cavity is normal. The right contains a slight excess of fluid, which is faintly clouded and slightly blood-tinged.

CHART V.—Clinical chart of Case III. Interstitial emphysema, with recovery.

Lungs. The pleural surface of the left is smooth and glistening. The lower lobe, although it contains air, feels heavier and less crepitant than normal. On section the lower lobe is congested, and the cut surface, from which frothy fluid escapes, is very finely granular, the appearance suggesting the consolidation of innumerable groups of small numbers of alveoli, these being separated by small groups of air-containing alveoli. The upper left lobe is crepitant and pale pink in color. The pleura of the lateral surface of the right lung is finely granular and hemorrhagic, but its surface contains the fibrin. The lower lobe is congested, and like the lower left lobe is heavier and less crepitant than normal. On section it is somewhat more deeply congested than the lower left lobe, but has the same very finely granular appearance. The upper and middle left lobes appear normal. The bronchi of both lungs are deeply congested, but contain no exudate.

Heart. The right side is distended with blood. All the valves and the root of the aorta are normal. The heart muscle is pale and cloudy.

Spleen. The spleen is enlarged to about three times the normal and feels rather soft. The outer surface is smooth and is dark bluish red in color. On section the tissue is dark red and much blood escapes from the surface.

Liver. Normal externally. On section the tissue is cloudy. Gallbladder and ducts are normal.

Kidneys. Each is slightly increased in size. On section the cortex is swollen and cloudy and the glomeruli stand out as minute, slightly congested points.

Adrenals, pancreas, gastro-intestinal tract, bladder and prostate. Negative.

Bacteriology. Cultures from the heart's blood and from the fluid of the right pleura show no growth. Smears from the lower lobes of the lungs show Gram-negative small bacilli and Gram-positive diplococci. Cultures from the lung yield *B. influenzae* and a Gram-positive, bile insoluble, non-hemolytic streptococcus.

Autopsy Protocol, No. 2.

Name: F. W. T.

Rank: Pvt., Co. E, Dev. Bn.

Admitted: September 29, 1918.

Died: 9 A.M., October 4, 1918.

Autopsy: 10 A.M., October 4, 1918.

Clinical Diagnosis. Lobar pneumonia.

Anatomical Diagnosis. (1) Lobar pneumonia of the right lower lobe (red hepatization); (2) pseudolobar pneumonia of the left lower lobe; (3) bronchopneumonia of both upper lobes and of the right middle lobe; (4) acute catarrhal bronchitis of both lungs; (5) acute fibriopurulent pleuritis of right lung; (6) acute splenic tumor; (7) cloudy swelling of liver, myocardium and kidneys.

External Examination. The body is that of a slenderly built

white male, about seventy inches tall, weighing about 146 pounds. The body is still warm and rigor is absent. The neck and face are cyanotic. On the inner surface of the left knee is a large old scar of a burn.

Internal Examination. Peritoneal, pericardial and left pleural cavity are normal. A thin layer of yellow exudate is present over the lower outer half of the right upper lobe and between the lobes.

Lungs. The lower lobe of the left lung is occupied by irregularly shaped confluent patches of dark red, airless tissue, which is congested and granular on section. A smaller wedge-shaped area is present at the lower border of the right upper lobe. The right lower lobe is completely consolidated and on section the tissue is dark red and granular and contains much blood. A few small patches of consolidation are present in the right upper and middle lobes. The bronchi of both lungs are congested and contain no exudate.

Heart. Negative except for cloudy swelling of the muscles.

Spleen. The spleen is increased to twice the normal size. On section the tissue is dark red and soft.

Liver. Cloudy.

Kidneys. The cortex is swollen and cloudy.

Adrenals, pancreas, gastro-intestinal tract, bladder and prostate. Negative.

Bacteriology. Smears from the right upper and lower lobes and from the pleural exudate contain many Gram-positive diplococci. Cultures from these situations contain pneumococci. Culture from the spleen is negative. The heart's blood culture is contaminated by a large Gram-negative bacillus, but contains Gram-positive diplococci, which prove to be Type IV pneumococci in the peritoneal exudate of a mouse injected with the culture.

Autopsy Protocol, No. 3.

Name: R. F.

Rank: Pvt., Co. H., 5th Infantry.

Admitted: September 26, 1918.

Died: 12.50 P.M., October 10, 1918.

Autopsy: 3.30 P.M., October 10, 1918.

Clinical Diagnosis. Influenza. Bronchopneumonia of the left lower lobe. Interstitial emphysema bilateral.

Anatomical Diagnosis. Interstitial emphysema bilateral. (1) Pseudolobar pneumonia of both lower lobes; (2) bronchopneumonia of both upper lobes and of the right middle lobe; (3) interstitial emphysema of the mediastinum and of the subcutaneous tissue of the face, neck, thorax and arms.

External Examination. The body is that of a sparely built white male about sixty-six inches tall, weighing about 130 pounds. Rigor and lividity are not present. The skin of the right side of the face and of the entire neck appears swollen, and on pressure it has a crepitant crackling feel. The same crepitant sensation is elicited upon pres-

sure of the skin of the chest anteriorly as far down as the nipple line, laterally on both sides of the chest to a slightly lower level and about half-way down on both arms. The skin of the crepitant regions is not discolored.

Internal Examination. The peritoneal cavity is normal. When the sternum is removed the tissues of the mediastinum are found filled with air, which occurs in the form of bubbles of varying size held in the loose tissues. The loose tissues of the root of the neck show a similar condition. The pericardial cavity is normal. Both pleural cavities are free of fluid and of adhesions. The lungs are not collapsed and no air is present in the pleural cavities.

Lungs. The two lungs are removed *in toto*, together with the trachea. Bubbles of air are present beneath the pleura of the left lung; these bubbles follow the lines of the interlobular septa. The pleura of each lower lobe posteriorly and laterally is granular and cloudy, but no macroscopic fibrin is present. All the loose tissue about the roots of the lungs contain bubbles of air. The lungs feel heavy, the lower lobes being enlarged and dark red in color. Areas of consolidation are present in both upper lobes, and about half of the right middle lobe is solid. Although the lower lobes are almost completely consolidated, small areas of air-containing tissues are present at the margins and in several places beneath the pleura. When the lungs are immersed in water and inflated by a tube placed in the trachea a steady stream of air bubbles escape from the tissue at the bifurcation of the trachea, the air apparently coming from the left bronchus anteriorly at the level of the bifurcation. On opening the trachea a small tear is found in the mucosa of the anterior wall of the left bronchus in the region from which the air was seen to escape. On section of the lungs both lower lobes are dark red and granular. Scattered about in the dark red tissue are numerous more opaque gray areas two or three lobules in size; these areas appear to have a peribronchial distribution. The right middle and both upper lobes contain areas of consolidation, of varying size, which are grayish red in color and rather soft and friable. The bronchi contain no exudate and their mucosa is not reddened.

Spleen. The spleen is moderately enlarged, firm and dark red. The remaining organs were not examined further.

Bacteriology. Smears and cultures from the right lower lobe show nothing. Cultures from the spleen and heart's blood remain sterile. Smears from the left lower lobe show a few Gram-positive diplococci; the cultures show numerous Gram-negative small bacilli and Gram-positive cocci in pairs and chains. The latter type are Type III pneumococcus.

Autopsy Protocol No. 4.

Name: W. McC.

Rank: Pvt., Co. A, M. P.

Died: 5.15 A.M., October 20, 1918.

Autopsy. 11.00 A.M., October 20, 1918.

Clinical Diagnosis. Pneumothorax.

Anatomical Diagnosis. Pneumothorax (left); suppurative pneumonia of the left lung; bronchopneumonia in the right.

Histological section of the tissue of the right lung, left lung and spleen.

External Examination. The body is that of a well-developed male, weight about 165 pounds, six feet in height. Rigor mortis is present. The skin is clear and there are no deformities or marks; the appearance of his face indicates some emaciation.

Internal Examination. An incision is made from the suprasternal notch to the pubes. The subcutaneous tissue is in good shape.

Lungs. The left lung has completely collapsed. It is nodular, grayish in color which is due to a fibrinous exudate, but there are no adhesions and a little fluid containing pus in the pleural cavity. On section pus flows freely from every nodule. The lung is full of abscesses ranging from the size of a hen's egg to minute abscesses. The bronchi are filled with pus. The right lung has a consolidation in the lower posterior portion of the upper lobe involving the upper posterior third of the lower lobe. The rest of the lung feels as though it is in fairly good shape with plenty of air in it. On section there is pus in the consolidated portions and also, some little pus in the bronchi. The air cells in the seemingly good portions of the lung contain in various areas a little frothy fluid but there are no evidences of inflammation. There are no adhesions except the adjacent consolidated portion. There is little fluid in the right pleural cavity.

Heart. The heart is negative.

The *liver, pancreas, intestines and peritoneum* are all negative.

Spleen. The spleen has an infarct about the size of a fifty-cent piece on the upper anterior third. On section it seems inflamed and is somewhat enlarged.

Kidney. The right kidney is large, red and seems swollen, and the capsule peels off easily, but on section it is negative. The left kidney seems identical with the right. The appendix is negative.

BACTERIOLOGICAL OBSERVATIONS ON THE EPIDEMIC OF INFLUENZA AT CAMP BEAUREGARD, LA.

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THERE has been so much discussion and uncertainty, so much curiosity and inquiry regarding the etiological factors in the prevailing epidemic of so-called Spanish influenza, that it is deemed appropriate to report the results of our work at this Base Hospital.