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"PRIMARY ATYPICAL PNEUMONIA"

AN EPIDEMIC ASSOCIATED WITH MALARIA

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There is still considerable doubt as to what extent atypical pneumonia is a "new" disease in the sense that von Economo's encephalitis was a new disease in 1918, or whether until recent years these cases went unrecognized under such diagnoses as bronchitis, bronchiolitis, pneumonitis, etc. There appears to be considerable variation in the severity of the illness, and in some published series most of the cases were mild. Thus Campbell *et al.* (1943), while reporting one death in 200 cases, say that on the whole they were mild with infrequent complications, and among 75 cases occurring in a college Contratto (1943) reports that none was serious. It can readily be believed that the milder cases occurring sporadically may have gone unrecognized, but it is not so easy to see how, in its more acute manifestations, the disease could have passed the notice of clinical and radiological scrutiny, especially when encountered in an epidemic form.

The review of early reports in the excellent paper of Drew *et al.* (1943) makes it clear that similar cases were apparently noted from time to time in America, France, and Spain during the past 10 years. But it seems to have been a rarity in Great Britain, and only since the war began have frequent reports drawn attention to its prevalence. Most of the recent reports are from the Services, and the careful medical scrutiny which is given even to minor illness probably accounts for the identification of many mild cases which would pass unrecognized in civil practice.

Whether or not it was frequent but undiagnosed before the war, it seems that the increased incidence now noted is due to the opportunities for infective spread in the crowded communities inevitable in wartime, and it invites comparison with the influenzal pneumonia of 1918. Fortunately, atypical pneumonia so far has manifested as a disease of relatively mild incidence and low morbidity. It has been suggested (Army Medical Department Bulletin, 1943) that dietary deficiency may account for the increase in certain cases, but this certainly does not apply to the Services. Whether in debilitated populations the disease may develop more serious forms remains an uncomfortable possibility.

In a series of 125 cases Needles and Gilbert (1944) had one fatal case, which came to necropsy. The illness ran a typical course till the 11th day, and the patient then became dyspnoeic and cyanosed. Death occurred on the 18th day, and the main finding was a profuse purulent bronchiolitis. The authors point to the similarity between their cases and types of influenza described by workers in 1918-19.

Epidemiology

The present paper is based on a series of 112 cases treated in a military hospital while on service in North Africa and Italy. Only a handful were encountered in Africa, but during the first few months in Italy the numbers were such as to suggest an epidemic. Leishman and Kelsall (1944), in a review of their

work in a hospital in India, report no case of atypical pneumonia in a total of 11,645 cases. This, in association with other reports we have been able to review, suggests that atypical pneumonia is a disease of temperate climates and is rare in the Subtropics and Tropics. It is generally accepted that atypical pneumonia is of virus origin, but no relation has been shown with any of the known virus diseases. The psittacosis virus has been suggested as a possible cause, but in Italy birds of any sort, not to mention parrots, are a rarity. In addition, atypical pneumonias have been noted in association with lymphocytic choreomeningitis, rickettsial infections, Rocky Mountain fever, influenza, chicken-pox, and other diseases thought to be due to virus infections. Howat and Arnott (1944) report seven cases of atypical pneumonia in small-pox contacts, and quote Reimann, Hewens, and Price, who claim that this syndrome may be produced by smallpox virus. It is perhaps worth noting that prior to the quasi-epidemic of atypical pneumonia here described there had been a large incidence of infective hepatitis, also a virus disease of unknown origin, and the two diseases were seen in comparable numbers throughout the period of investigation. We were unable to show any relation between the two. No lung lesions were found in a selected number of cases of hepatitis, and although two cases of atypical pneumonia developed mild jaundice, this is recognized as an occasional complication (Reimann and Stokes, 1939).

It is clear, therefore, that an atypical pneumonia may occur in association with most of the known virus diseases, but there is no evidence to show that primary atypical pneumonia is associated with any one in particular.

There was no case of cross-infection in any ward nursing atypical pneumonia, and no member of the staff was infected. We were, however, able to obtain some evidence of infectivity among patients admitted from the same units. Thus there were several groups from the same military units, many beginning on the same day, and therefore suggesting a common source of infection, and, in addition, evidence that others had been infected by their comrades. From a survey of 30 such cases, made up of groups from five units, it was possible to arrive at a probable incubation period, with extremes from 6 days to 12 days; the average incubation period was 10 days. It appears, therefore, that the disease is infective only during incubation, and that, when established, may, like infective hepatitis, be treated in general wards without fear of cross-infection. Vance *et al.* (1943) gave sputum and nasal washings from 12 patients to 5 volunteers intranasally. They failed to produce infection. This supports the view that the established disease is of low infectivity.

Onset and Course of Illness

The onset was marked in most cases by fever, malaise, and shivering (or a definite rigor), muscle pains, headache, anorexia, and, in a few, constipation and nausea. One case began with

vomiting, one with diarrhoea, and a third had a small haemoptysis as the first sign of illness. These groups were distinguished according to the mode of onset :

1. Gradual onset with low fever, malaise, and some of the mentioned symptoms in a mild form (39=34.8%).

2. More sudden onset with pain in the chest and high fever. Two cases in which the lesion manifested at the extreme base had pain in the corresponding side of the neck as the initial symptom (39=34.8%).

3. In a third group the initial symptoms were masked by malaria, and were diagnosed by discovering a few malarial parasites in a patient who was not responding to quinine (34=30.4%).

The second group, who showed no evidence of malaria, had an onset severe enough to suggest at first malaria. These cases usually ran an acute course with high fever, and demonstrate that atypical pneumonia is not always a "benign" illness, unless one restricts the term to the question of morbidity and complications. The fever usually finished by rapid lysis about the eighth day, with extremes of 1 and 24 days. There was considerable debility in most cases, but 7 to 14 days after subsidence of fever they were able to be transferred to a convalescent depot, and were then seen a month later for further radiographs. Convalescence was continued if necessary till the lung fields were clear.

Age Incidence

In common with American reports, in this series we found a maximum incidence in the younger age groups, as is shown by the following figures :

Age Group:	15-19	20-24	25-29	30-34	35 and over
No. of cases	1	43	27	25	16

In this respect atypical pneumonia is quite unlike pneumococcal pneumonia.

Symptoms

Cough.—As an early symptom, cough, troublesome and non-productive, is described by other writers (Drew *et al.*, 1943; Meakins, 1943; Correll and Cowan, 1943; Leake and Blatchford, 1943), but in this series cough was slight or absent in 69 (61%), and in the remainder was never troublesome—that is, counter-measures were not required.

Rigors.—Of the 112 cases 59 had shivering at or near the onset, and in a large number—about 25% of the whole—there was a brisk rigor signalling a sudden onset. Discounting those who had a malarial complication, the remainder showed a similar onset, 50% having initial shivering, and about half of these a definite rigor. Unlike lobar pneumonia, the rigor, when it occurred, was not closely associated with chest pain, although in most cases there was pain of various types a few days after the onset.

Pain in the Chest.—Of the 112 cases 70 had pain of some sort in the chest. It was not so severe as typical pleuritic pain, and was found as a rule to be strictly localized to the site of the lung lesion. The majority had pain in the antero-lateral aspects in relation to the fan-shaped lesion spreading from the hilum. In others the pain was felt in the back, again on the side, and

involved early. This is in line with the view, long held by one of us (J.F.), that the so-called pleuritic pain is not due to friction between inflamed pleural surfaces but to a spasm of the chest musculature over the site of the lesion. The pain was not notably aggravated by cough or deep respiration, and only in one case was morphine required. In Meakins's (1943) cases this "non-pleuritic" pain only was noted, but Drew *et al.* (1943) found friction pain in four cases in their series of 50, and Markham (1942) found pleural involvement in three of 65 cases. It is evident that the atypical lesion does not usually spread to involve the pleura. Even when radiologically the lesion had apparently spread to the lung periphery no friction was detected.

Sputum.—The quantity and type of sputum were found to be roughly related to the extent of the lung lesion and to the severity of the illness in general. Thirty-four (30.4%) had no sputum throughout, but one of these was ill enough to be put on the "serious" list. All the others had a little mucous sputum early in the illness, but it was seldom notable before the third or fourth day, by which time it had usually become mucopurulent, and 24 on or about the fourth day had some blood present. In four the sputum at one point could be described as rusty! Drew *et al.* suggest that such a finding calls for a review of the diagnosis, but all were otherwise typical (e.g., Case 28).

Bacteriology of the Sputum.—In every case except one sputum culture produced a mixed flora. Pneumococci were present in almost every case, usually in association with streptococci; but frequently Friedländer's pneumobacilli, and less frequently *Micrococcus catarrhalis* and staphylococci, were also present. In one case Pfeiffer's bacillus was in association with pneumococci and streptococci, and in two cases only a few pneumococci were grown from scanty mucoid sputum. The almost constant presence of pneumococci raises the question of their pathological significance; but the course of the illness, uninfluenced by sulphonamides, the low leucocyte count, and atypical lung appearances, made it unlikely that they were more than the normal flora of the upper respiratory tract. One of us (J. F.) has shown that a low leucocyte count in the early stages of pneumococcal pneumonia is found only in extremely toxic cases, usually Types II, III, and related types. In such cases the lung lesions are as a rule massive and typical. Unfortunately, biological selectivity tests were not available to us.

Leucocytes.—Counts were made in 68 cases during the first 48 hours after admission (most of the cases were admitted on the first or second day of illness), and in many instances were repeated on the sixth and ninth days. The highest count was 13,600 per c.mm., and the lowest 3,400; 20 (16.9%) were under 6,000, 62 (55.3%) were under 10,000, and 5 were more than 10,000. These findings are similar to those of Meakins (1943), who found less than 10,000 per c.mm. in 73% of his cases; Leake and Blatchford (1943), who found counts from 6,000 to 9,000; and Correll and Cowan (1943), who found less than 9,000 per c.mm. in 55.5% and less than 12,000 in 95%. Haight and Trolinger (1943) state that while the count was low or normal at the onset, later they found mild leucocytosis. In the present series two were found to have an increase from

Differential White Cell Counts : Percentages

Case No.:	1	2	3	10	12	20	25	27	28	35	36	39	51	53	56	64	66	74	82	84	90	92	93	98	100	110	112	118	119	120
Polymorphs	56	64	70	50	31	61	28	49	64	61	59	39	52	62	44	63	68	54	56	50	69	70	68	66	52	62	47	55	85	61
Lymphocytes	36	27	22	44	62	30	69	47	30	34	39	46	43	36	50	32	25	45	43	30	24	23	33	32	28	32	37	40	14	37
Monocytes	7	8	4	5	7	7	3	4	5	4	2	5	5	5	4	5	7	1	1	10	6	6	8	2	14	4	8	4	1	2
Basophils	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Eosinophils	1	1	3	1	—	1	—	—	1	1	—	—	—	1	2	—	—	—	—	1	1	1	1	—	2	1	6	1	—	—

at the site of the lung lesion. In seven cases pain was felt in the supraclavicular region and in the neck; in five of these a lesion in the upper lobe was found, but in two others the lesion was situated on the diaphragm, indicating reflex irritation via the phrenic nerve. In three cases in which a dense lesion was found spreading from the midzone of the hilum the patients complained of a constricting pain across the chest at this level. Although pain was so frequent, friction was not detected in any case, thus sharply differentiating this type of lesion from that of lobar pneumonia, in which the pleural surface is usually

7,600 and 5,000 on the third day to 10,400 and 9,600 respectively on the sixth day, but most showed no notable change, and in several the count decreased—e.g., in one, 7,800 on the third day, 6,100 on the sixth, and 4,600 on the ninth. Shone and Passmore (1943) state that one of their cases had a leucocytosis of 61,000 per c.mm.; this must be exceptional. In 30 typical cases we made differential counts (see Table).

With few exceptions these counts reveal a relative lymphocytosis with a slight increase in monocytes. There was no eosinophilia and no primitive cells were noted. Moeschlin

(1943) finds a lymphocytic reaction to be usual in virus pneumonia (primary atypical pneumonia) between the 12th and 17th days. The lymphocytes may form 74% of the total white cell count on the 13th day, and then begin to fall. He also noted an eosinophilia as high as 10% on the 13th to 15th days. Similar changes are found in infectious mononucleosis, measles, and hepatitis. He points out that in pneumococcal pneumonia the lymphocytes are usually less than half the total of those present in atypical pneumonia, and suggests that this fact may be useful in differential diagnosis.

Cold Agglutinins—Ramsay and Scadding (1939) and Turner *et al.* (1943) report that high titres of cold agglutinins were regularly found in primary atypical pneumonia. This promises to be of great value in differentiation. Under field conditions it was found to be impracticable to undertake this investigation for the series. In two cases with characteristic clinical and radiological findings cold agglutinins were absent.

Physical Signs

Most of our patients had sharp fever. The average duration of pyrexia was 8 days—ranging from 1 day to 24 days; in 51% it was 8 days and less, and in 81% 10 days and less. In many cases the illness began with high fever, in 82% reading more than 102° F.; 42 had peaks of 103° F. or more, the highest being 105.4° F.; only 8 of these latter had an associated malaria. In remarkable contrast to the high level of the temperature curves, there was little or no change in pulse or respirations. Brachycardia was not observed (Drew *et al.*, 1943; Meakins, 1943). Cyanosis and dyspnoea were unusual or absent, as was to be expected from the small amount of lung tissue involved. About 70% had frontal headache, which was sometimes very intractable and suggested meningeal irritation. Five had suffusion of the eyeballs, and slight labial herpes was noticed in 4 cases. Faucial congestion (3 cases), epistaxis (2 cases), jaundice (2 cases), and petechial rash (1 case) were also noted. Gastro-intestinal disturbance was rare, and occurred usually at the onset (anorexia, nausea, diarrhoea, and constipation). Six patients were notified as being seriously ill; but once the diagnosis was established there was little cause for anxiety, and the illness terminated quietly by lysis. There was no case showing albuminuria, and no diminution of chlorides was observed.

Enlarged spleen was found in only 8 patients, and 5 of these had an associated malaria. Owen (1943) noted an enlarged spleen in 8 of 16 patients, not associated with malaria.

Chest Signs.—Twelve patients had no detectable physical signs throughout the illness. They were found to have minimal lesions radiologically—either centrally, in a lobe, or closely applied to the hilum. Ten who had no signs during the first few days, when the lesion was still distal from the periphery, had detectable signs later, when radiographs showed spread to the lung surface. As has been generally noted, the most common finding was small crepitations strictly localized to the area of the lesion, and usually accompanied by a diminished breath sound. Next in frequency came harshness of the breath sound, and in many cases a soft tubular breath sound was heard. Occasionally, when the lesion was larger and denser, and especially if basal, the percussion resonance was diminished, but frank dullness was not observed. Since the lesion usually is relatively small and may occur in any part of either lung from apex to base, a very careful examination of the whole surface area is necessary. At first we failed at times to detect signs until radiographs had indicated the place, but latterly the significance of localized small signs had made the diagnosis possible before radiological confirmation. In no case was there any evidence of pleural effusion.

Complications.—Drew *et al.* in their series of 50 had three cases of otitis media and one of antral sepsis, and in common with other writers they found a secondary rise of temperature "on many occasions." Secondary temperatures did not occur in our series, and there were no complications, except in two cases which early in the illness developed mild transient jaundice. This absence of complications we ascribe in part to the routine use of sulphonamides, which for this reason, and for other reasons stated below, we recommend in treatment. Leake and Blatchford report that chemotherapy is ineffective, and that they had no complications. We believe that "chemo-

therapy" (meaning sulphonamides) and "no complications" are more closely related than is implied.

Treatment

We kept our patients in bed for 7 to 14 days after the temperature became normal, and continued convalescent care, usually in an adjoining convalescent depot, till the lung was clear radiologically. As full a diet as the appetite allowed was our rule, for there were no gastro-intestinal difficulties worth mentioning. Chest pain and cough yielded to simple measures. When the temperature was high it was dealt with by sponging, but the absence of respiratory embarrassment (as in lobar pneumonia) allowed these patients to be comfortable in spite of a high temperature.

There is no specific treatment, but several good reasons may be advanced for giving a sulphonamide when the lung lesion has been found.

1. The diagnosis of "atypical pneumonia" cannot be made with certainty in the first few days of illness even with x-ray evidence, and the administration of a sulphonamide for at least a few days is a valuable therapeutic test and an assurance against missing a pneumococcal pneumonia.

2. The "atypical" lesion is a debilitated area of tissue probably highly vulnerable to the flora of the upper respiratory tract, especially pneumococcus and streptococcus. It seems reasonable to hope that sulphonamides may inhibit secondary infection by these possible invaders.

3. It may be objected that sulphonamides may depress the already low leucocyte count. But it appears that the leucocyte count in these cases is around normal figures because this type of infection does not call forth a leucocyte response, since there is no indication that the count is low because of "depression" of the marrow. If this be so, it is not to be expected that sulphonamides will adversely affect the leucocytes to any extent. The findings in this series seem to indicate that sulphonamides from this point of view are harmless in the ordinary case.

On these grounds we gave to every case 2 g. of sulphapyridine or sulphathiazole when the diagnosis of a "pneumonia" was made, and continued with 1 g. every four hours for three or four days.

Association with Malaria

The majority of our cases were admitted during a period when there was a heavy incidence of malaria in the area. About one-third (30.3%) had the typical lung lesion in association with malaria. The presence of malaria did not, however, have any influence on the period of pyrexia due to the atypical pneumonia. In both groups (atypical pneumonia plus malaria, and atypical pneumonia alone) the average duration of pyrexia was eight days (Case 15).

If we had not been aware of the prevalence of atypical pneumonia many of the malaria-infected cases might from physical signs alone have been assumed to have merely associated bronchitis of malarial origin. Several cases had an acute onset resembling malaria, and the diagnosis became clear only as the illness progressed unaffected by quinine therapy (Case 49).

The fact that the presence of malaria, and antimalarial therapy, did not influence the duration of pyrexia seems to support the view that the association was fortuitous, although it is possible that a latent malaria might be activated by the onset of atypical pneumonia. Conversely, a population debilitated by malaria may well be more susceptible to this virus infection.

In North Africa we saw very many cases of malaria and only a handful of atypical pneumonia; but these malaria cases were largely fresh infections in healthy troops, whereas about 50% of the malaria infections seen in Italy were relapsed cases, often many times relapsed.

It would seem, therefore, to be true for primary atypical pneumonia, as according to Osler (Christian, 1942) it is for pneumococcal pneumonia, that its occurrence in association with malaria is fortuitous.

Radiological Findings

In common with other observations the x-ray findings in this series showed much diversity. In 56% the lesion was right-sided and there was a predilection for the middle and upper zones. In the lower zones the costophrenic angle area (Case 120) and less often the cardiophrenic area were the

sites mainly affected. Lesions maximal at the hilum were usually on the right side.

In a few cases a whole lobe appeared to be involved, but in the large majority the lesion was small. The area of opacity in no case traversed more than one lobe, but in three cases a lesion was found at both bases. The appearances in these latter resembled the tracheobronchitis described by Kornblum and Reimann (1940). The opacities were never so dense as in pneumococcal pneumonia and usually showed some degree of

FIG. 1.—Case 15 Atypical pneumonia and benign tertian malaria.

FIG. 2.—Case 49. Onset resembling malaria.

mottling. Three showed an area of loss of translucency with marked reticulation at the hilum similar to the second type of Drew *et al.* (1943). The edges were indefinite except where bounded by a pleural line.

In one group the lesion was localized at the periphery but had no apparent connexion with the hilum; some of these were fan-shaped, with the apex towards the hilum (Case 118), but others were rounded or oval. In one the whole right supraclavicular region was involved. Where the lesion was fan-shaped one or more branches of a main bronchus were seen to be involved, as in the "partial pneumonias" described by Shanks, Kerley, and Twining (1938). In one case a lesion starting at the periphery was followed serially and was seen to spread towards the hilum.

The opacities usually persisted for some time, often several weeks, after the patient was afebrile, although in a small number resolution was complete before the patient left the hospital for the convalescent depot. In all those we were able to follow (34) the lung fields were clear in from four to six weeks after becoming afebrile, but frequently a thickening of the pleural line persisted. In nearly all cases the hilar shadow was enlarged on the side of the lesion only. In several cases with upper-zone lesions the x-ray appearances suggested tuberculosis, but serial films and the clinical course readily eliminated this diagnosis. Other writers state that lung abscess, carcinoma of the lung, unresolved lobar pneumonia, and bronchiectasis may simulate the appearances of atypical pneumonia; that difficulty did not arise in this series.

After the considerable experience afforded by this investigation it was found possible to make a fairly definite diagnosis by radiograph only; but, where there was doubt, correlation with the clinical findings clarified the issue.

Illustrative Cases

Case 2.—Pte. A., aged 20, was admitted on May 7 with a history of two days' headache and aching in the back. He shivered at the onset, and since then had been perspiring. He complained of loss of appetite and slight nausea, and had a little dry cough. There was no past history of malaria. On admission he was flushed and looked "toxic." No physical signs were detected in the chest. Temperature 101.8° F., pulse 100, respirations normal. Blood smears for malaria were negative. Two days later he complained of a tight feeling across the chest, and sticky rales were heard over the right upper lobe anteriorly. Next day a small crop of petechiae appeared on the chest and back. The white cell count on May 9 was 5,500 per c.mm. (polymorphs 64%, lymphocytes 27%, eosinophils 1%, mononuclears 8%). Some mucoid sputum obtained on the same day showed a few pneumococci, pneumobacilli, and non-haemolytic streptococci. The fever continued for six days and fell by lysis. Radiography showed infiltration extending from the right upper hilum to the right apex. This case was one of five admitted from the same unit; they were probably infected on the same day.

Case 15.—Pte. B., aged 20, had been over-seas for nine months, but had previously been well. His illness began on April 13 with the gradual onset of headache. He had no shivering, cough, or sputum. His temperature rose to 101.5° F.; pulse 90. Blood smears were positive for B.T. malaria, and he was given full doses of quinine. Next day his temperature was 103° F., and a harsh breath sound with a few crepitations was noted over the right middle lobe. Radiographs showed an area of infiltration, chiefly at the periphery of the right midzone and bounded below by the right middle pleural line. His temperature persisted around 102° F. for seven days, terminating by lysis on the eighth day. A follow-up radiograph on May 6 showed no abnormality.

Case 16.—L/Cpl. C., aged 25, was admitted on April 28. Four days previously he had a sudden onset of headache and backache accompanied by a rigor. On the morning of the 25th he awakened with a stabbing pain in the left back on breathing or bending. On the 27th a blood smear showed B.T. malaria, and quinine in full doses was given. On the 29th radiographs showed a small opacity in the left midzone, chiefly peripheral. On the 25th his temperature was 105° F. and pulse 100; thereafter he ran a sharp fever, un-influenced by quinine, for six days. The white cell count was 9,650. A repeat radiograph on May 12 showed clear lung fields. In this case there were no physical signs and no sputum throughout the illness.

Case 28.—Cpl. D., aged 22, was admitted on April 25 complaining of headache and of shivering for two days. Next day blood smears showed B.T. malaria, but examination of the chest was negative. On the 27th he produced some rusty sputum, and radiographs showed a fan-shaped patch of consolidation extending from the right upper hilum and bounded below by the right middle pleural line. The white blood count was 5,650 per c.mm. (polymorphs 64%, lymphocytes 30%, monocytes 5%, eosinophils 1%). The sputum contained many pneumococci, with streptococci and Friedländer's pneumobacilli. He ran a moderate temperature (100° to 101° F.) for eight days, and had a rapid convalescence.

Case 49.—Pte. E., aged 29, was admitted on April 29 with a history of sudden onset of headache, shivering, general aching pains, and slight cough, of 12 hours' duration. Blood smears for malaria were negative. On admission he had some small rales in both mid-zones, and next day a soft tubular breath sound was heard in the right lower zone anteriorly. Radiographs showed a band of consolidation extending from the hilum to the periphery and situated on the diaphragm. The white cell count was 13,600. There was no sputum throughout the illness, and he ran an intermittent high fever swinging between 100° and 104° F. for eight days, un-influenced by full doses of sulphapyridine. Blood culture was negative. Convalescence was disturbed by the onset of a mild dysentery (Schmitz), but otherwise he made a rapid recovery.

Case 66.—Gnr. F., aged 22, was admitted on April 22 with a history of sudden severe headache, shivering, and backache two days previously. Blood smears for malaria were negative. During the first five days no physical signs were detected and he was treated for malaria, but on the 28th scattered rhonchi were heard over the right upper chest and, later, crepitations were heard at the inner end of the fifth right interspace. The white cell count was 5,800 per c.mm. (polymorphs 68%, lymphocytes 25%, monocytes 7%). Radiographs showed a small patch of consolidation in the right inner subclavicular region. He had an intermittent high fever for eight days, swinging between 100° and 103° F.

Case 68.—L/Sgt. G., aged 25, was admitted on April 28. For three days he had felt unwell with slight headache, anorexia, and backache. He had a slight cough but no sputum or chest pain. On admission his temperature was 102° F. and pulse 95. On the 30th he had a rigor, and blood smears showed B.T. malaria. On the same day crepitations were heard over the left upper zone anteriorly and radiographs showed a fan-shaped area of consolidation extending

outwards from the left upper hilum to the outer subclavicular region. The white cell count was 3,300. There was no sputum throughout the illness. He had eight days' mild pyrexia, and three weeks after the onset radiographs showed only a little residual striation.

Case 113.—L/Cpl. H., aged 21, was admitted on Aug. 16 complaining of headache, dyspnoea, and general malaise. He also had pain in the right chest anteriorly on respiration. Three days after admission he had a small haemoptysis, but no physical signs were detectable till the following day, when crepitations with distant tubular breathing were heard at the right base and radiographs showed an oval consolidation situated on the diaphragm, which was slightly elevated. The white cell count was 5,650 per c.mm. On admission his temperature was 100° F., but on the two succeeding days it reached 103° F., and settled by lysis on the sixth day. The pulse was never more than 100 and respirations 22. Culture of the sputum showed streptococci, pneumococci, and *M. catarrhalis*. A radiograph four weeks after the onset showed only a slight residual opacity.

Case 118.—Gdsman. I., aged 22, was admitted on Sept. 25 with a history of a few hours' headache and shivering. His temperature on admission was 104° F. and pulse 110. Blood smears were negative for malaria. On the 27th no physical signs were detected, but radiographs showed a fan-shaped area of consolidation in the left upper zone, chiefly peripheral. The left hilar glands were notably enlarged. The white cell count was 5,200 (polymorphs 55%, lymphocytes 40%, monocytes 4%, eosinophils 1%). He had no sputum till four days after the onset, when there was a slight haemoptysis. He had a high intermittent fever (100° to 104° F.) for nine days, but made a rapid convalescence.

Case 120.—Dvr. J., aged 37, was admitted on Sept. 23 complaining of headache, shivering, and backache. He had a slight cough with a little mucoid sputum, and complained of pain in the left lower chest anteriorly. A few coarse crepitations were heard in this area, and radiographs showed a fan-shaped opacity in the left lower zone of medium density, extending outwards from the lower hilum and leaving the costophrenic angle free. The white cell count was 5,000 per c.mm. (polymorphs 61%, lymphocytes 37%, monocytes 2%). Blood culture was negative. Temperature on admission was 101° F.; thereafter he ran a high intermittent fever, with frequent peaks of 103° F., for nine days. Radiographs three weeks after the fever subsided showed that the lesion was rapidly resolving.

Discussion

During some months of the Italian campaign atypical pneumonia was an important cause of long-term sickness. As compared with other reports available to us, our cases ran a much more acute course, as evidenced by the high temperature maintained with small intermissions, but complications were absent and there was no morbidity. Our evidence supports the view that the disease is of virus origin, and the similarity of the clinical and radiological pictures suggests that in this series the same virus was responsible. There was no evidence of association with other known virus diseases. It is notable that diseases presumably due to a virus—infective hepatitis, varicella, poliomyelitis, and atypical pneumonia—have occupied a pre-eminent place as causes of long-term sickness in this campaign. This is testimony to the fact that in the Second World War the bacterial diseases have been largely under control, thanks to sulphonamides and the various prophylactic measures. Apart from typhus, the answer to most of the virus diseases is still awaited.

In many cases the severity of the illness was in marked contrast to the small area of lung involved. This suggests an analogy with poliomyelitis, in which the lesion may be very small even in fatal cases. But while a small local lesion is the rule in poliomyelitis, fatal cases occur, with widespread damage to the nervous tissue. Is it to be feared that atypical pneumonia also may produce extensive lesions, and will this prove to be the "influenzal pneumonia" of 1918 and 1929? Just as in severe cases of poliomyelitis acute haemorrhagic reaction may occur, so in atypical pneumonia frank bleeding from the irritated lung tissue is not infrequent, unaccompanied by the bacteria-laden mucus seen in pneumococcal pneumonia.

In view of the frequent association of malaria and atypical pneumonia in this series we recommend that cases of malaria which fail to respond to quinine should have a thorough clinical and radiological examination to exclude the association. It has been our practice in these cases to continue antimalarial treatment with quinine only when the atypical lesion has been discovered; for, as we have stated above, every patient in whom the pneumonia was diagnosed was given sulphapyridine or

sulphathiazole, and it has been our experience that a sulphonamide and mepacrine together may not be well tolerated. The combined use of a sulphonamide and quinine, on the other hand, causes no disturbance.

Summary

Cases of primary atypical pneumonia to the number of 112 were admitted to a military hospital in Italy during the spring of 1944. For some weeks the incidence reached epidemic proportions.

Most of the cases had an acute onset and ran a high intermittent fever for an average of eight days. In other respects the clinical findings were similar to those in recent British and American reports.

There were no complications and no morbidity, but there was considerable debility, requiring four to six weeks' convalescence, so that the majority of these men were off duty for a total of about eight weeks.

One-third of the cases had a benign tertian malaria infection in addition to atypical pneumonia. There was no evidence that the association was other than fortuitous in a population among whom malaria was prevalent.

Sulphathiazole and sulphapyridine had no effect on the course of the illness, but we ascribe the absence of complications and secondary fevers to their routine use. There was no indication that they had any toxic effect on the polymorphonuclear leucocytes, and when used in combination with full doses of quinine, in the malaria cases, no adverse effect was noted.

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INCIDENCE OF PUERPERAL AND LACTATIONAL MASTITIS IN AN INDUSTRIAL TOWN OF SOME 43,000 INHABITANTS

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It is very difficult to estimate the true incidence of mastitis, as most statistics come from hospitals and cases occurring in domiciliary midwifery practice are not included. In addition, information is not as a rule available to the hospital staff as regards the occurrence of mastitis in patients after they have been discharged from maternity hospitals—usually not later than, and often before, the fourteenth day of the puerperium. Hospital statistics thus tend to underestimate the number of cases.

Moon and Gilbert (1935) state that the frequency of puerperal infections of the breast is probably underestimated and too little notice is taken of the associated morbidity, the chief reasons for this being that (1) patients pass to surgical care other than that responsible for delivery, and (2) there is practically no mortality due to mastitis. Waller (1938) supports this view, and is sure that many lying-in institutions underrate the risk of breast infections through not hearing of the results. Chatillon (1941) says that statistics found in the literature, although valid for any particular institution, give only a very imperfect idea of the real incidence of mastitis because of lack of information