CLINICAL FEATURES OF PNEUMONIA IN EXTREME OLD AGE

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ABSTRACT

The clinical features of 70 people over the age of 85 with radiologically positive pneumonia were studied. It was shown that the classical presenting symtoms of pneumonia were often absent and 81% had one or more acute 'geriatric' features such as acute confusion, recent onset of falls, recent worsening immobility or recent onset of incontinence, at the time of presentation. An increased risk of mortality was associated with acute confusion, dementia, central cyanosis and long term immobility. Well kept body temperature and respiratory rate charts provide a useful early warning of possible pneumonia in very elderly inpatients and the finding of a raised body temperature with a raised respiratory rate should always prompt the need to rule out lower respiratory tract infection.

Keywords: *community acquired pneumonia, hospital acquired pneumonia, rectal temperature, axillary temperature, respiratory rate, white blood count.*

Introduction

Pneumonia is common in old age,[1] though the diagnosis can be difficult to make and the mortality is higher than in young people,[2,3] In extreme old age (85 years and above), clinical experience suggests that the diagnosis of pneumonia is particularly difficult, and doctors need to recognise as many subtle signs as possible to detect lower respiratory tract infections so as to maximize the probable benefits of early treatment. The value of a rise in respiratory rate has been shown in this context, [2] as has the value of careful body temperature measurement to detect mild pyrexia in old people with infection. [4] However, the very old have not been subjected to a separate study of this type. We therefore set out to document the clinical features of radiologically positive pneumonia in people over the age of 85, with particular emphasis on the measurement of febrile, tachypnoeic and peripheral blood leucocyte responses.

Patients and Methods

Ethical approval was obtained from the local ethics committee and informed consent was obtained from all subjects included in the study. Where this was not possible due to changes in mental state, consent was obtained from relatives.

We studied 70 inpatients (22 men, 48 women) with mean age of 88 years (range 85-97). All had radiological evidence of patchy or complete lobar or segmental lung consolidation in addition to clinical features of pneumonia. Patients with clinical or radiological evidence of heart failure, pulmonary embolism, intrathoracic tumour, lung fibrosis or extensive lung scarring were not included in the study. Fifty patients had community acquired pneumonia (CAP) and were admitted as unselected urgencies to the acute geriatric wards at The Royal Bournemouth Hospital. Twenty developed hospital acquired pneumonia (HAP) while they were inpatients on a rehabilitation ward in Christchurch Hospital. After radiological diagnosis, and before antibiotic or antipyretic treatment was given,

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rectal temperature (RT) was measured with a clinical thermometer left in place for three minutes. Total and differential leucocyte counts (WBC) were measured on peripheral venous blood before treatment. The respiratory rate (RR) was counted for a minute and an average of three readings was recorded (patient in semirecumbent position) at the time of presentation and 10 days after starting treatment in survivors. In those patients with HAP, RR values recorded prior to the onset of pneumonia were available for comparison, as were axillary temperature (AT) measurements which had been recorded four times daily with the thermometer left in place for five minutes. All patients had a single venepuncture two-bottle blood culture taken before antibiotic treatment was started. Simultaneous RT and AT were made on the HAP group at the time of diagnosis for comparison. Sputum suitable for Gram staining and culture was obtainable from only 31 patients.

All patients received treatment for coinciding conditions as required and supportive treatment for the pneumonia as indicated, including intravenous rehydration, oxygen and chest physiotherapy. The patients with CAP were given intravenous ampicillin and those who were very ill, or in whom atypical pneumonia was suspected, were also given erythromycin.[5,6] When the patients' condition had improved sufficiently, a change was made to oral treatment, and amoxycillin replaced ampicillin. Those with HAP received intravenous cefuroxime initially on the grounds that they were more likely to have infection caused by ampicillin resistant bacteria. A small number of patients had these regimens altered when the results of bacteriological tests became available. None had a hypersensitivity reaction, and the duration of antibiotic treatment in survivors ranged from 7-17 days with a mean of 9 days.

Statistical analysis was performed using Fisher's Exact Probability Test, Yate's chi squared test, and Wilcoxon's signed ranks test, as appropriate.

Results

Clinical Characteristics

Table I contains a summary of the main elements of the clinical presentation of pneumonia in this group of very old patients. The HAP group was not apparently frailer than the CAP. For instance the proportion of patients in each group who had long term inability to walk was similar (5/12 HAP, 13/50 CAP).[7] It is clear that the classical features of pneumonia are often lacking, and a large proportion of the patients presented primarily with 'geriatric' complaints. Overall 57 patients (81%) had one or more acute geriatric features on presentation. 19 (27%) died, 6 in the HAP group and 13 in the CAP group (difference not significant). A significantly higher risk of mortality was associated with acute confusion, central cyanosis, inability to walk unaided prior to the pneumonia, and a preceding diagnosis of dementia. Interestingly, the spontaneous complaints of cough and recent sputum production were significantly associated with a low risk of mortality, possibly because such patients were more alert and in better general condition.

The mean heart rate (HR) at the time of diagnosis was 89 (SEM - 3.75), falling to 84 (SEM - 3.75) after treatment in survivors. 18 (26%) had atrial fibrillation and only one of these returned to sinus rhythm after treatment. HR did not correlate with RR, RT or with an increased risk of mortality.

Chest radiograph

Fifty four patients (77%) had radiographic evidence of inflammatory shadowing in the right or left lower lobe, though only 6 (9%) had complete lobar consolidation; 11 (6%), had bilateral basal inflammatory shadowing and in 5 (7%) either the right or the left upper lobe or right middle lobe was involved. There was no apparent difference between the radiographic features of the CAP and HAP groups. No particular pattern of consolidation was associated with the higher risk of death, though both patients who had consolidation of more than 50% of their lung fields died.

Respiratory rate

Figure I shows the mean RR of the entire group before and after treatment. There was a significant mean fall of 12/min in the RR with treatment in survivors ($p<0.01$:Wilcoxon's signed ranks test). Furthermore, the mean rise in RR in the HAP upon acquiring pneumonia was 8/min. Neither a very high value of RR (>30/min) at the time of diagnosis nor a large rise of >10/min in RR in the HAP group were significantly correlated with an increased risk of death. In the CAP group, 2/9 patients with a RR >30/min died compared with 17/61 with an RR <30/min. In the HAP group 2/7 died when they had a rise in RR of >10/min compared with 4/13 with a rise of <10/min.

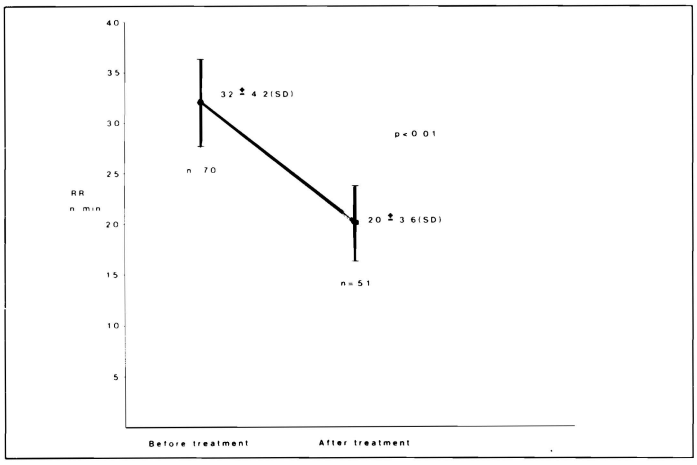


Figure I - Respiratory rate before treatment and 10 days after treatment in survivors

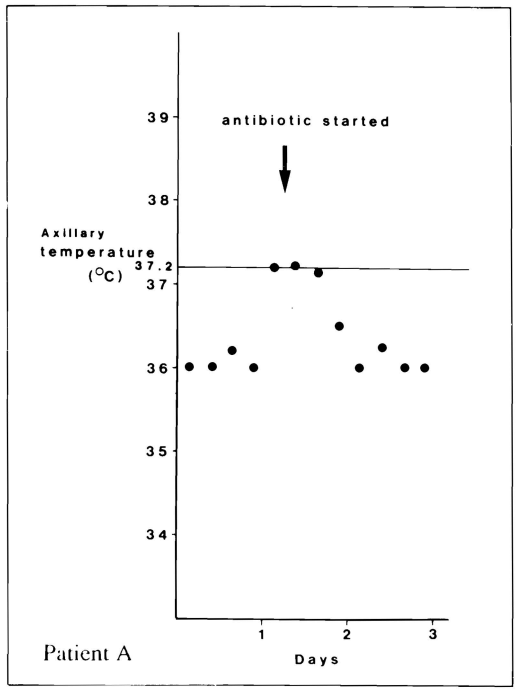
Rectal and axillary temperature

The mean pretreatment RT values at the time of the diagnosis was 37.9 ^{0} C and only 14 (20%) were below 37.4 ^{0} C. There was no significant difference between the CAP group (9/50 afebrile) and the HAP group (5/20) in this regard.

In the HAP group, all those with an RT above 37.4 ^{0} C had a simultaneous AT reading above 37.0 ^{0} C, in whom the mean value of RT-AT was 0.5 ^{0} C (Range 0.2 - 1.3 ^{0} C). Three of the afebrile HAP patients showed no clinically important (<0.2 ^{0} C) variation in the late afternoon AT pattern before, during or after their episode of pneumonia and can be regarded as having had no febrile response to respiratory infection. However, the 2 remaining HAP patients with pretreatment RT values below 37.4 ^{0} C had relatively low normal AT values which rose by about 1 ^{0} C at the time of acquiring pneumonia and fell to premorbid levels after antibiotic treatment (Fig II). These two patients clearly had a febrile response to respiratory infection, but this did not rise sufficiently to escape from the normal range. There was no significant increase in the risk of death in the afebrile group (4/14 died).

WBC

Figure III summarizes the peripheral venous blood WBC values at the time of diagnosis. The mean venous blood WBC was 16.8 x 10^9/L with a mean of 85% neutrophils; none had a predominantly lymphocytic response. It is noteworthy that 19 (27%) had a WBC value below 10 x 10^9/L, which is frequently regarded as the upper limit of normal, even when diurnal variation of the WBC is taken into account.



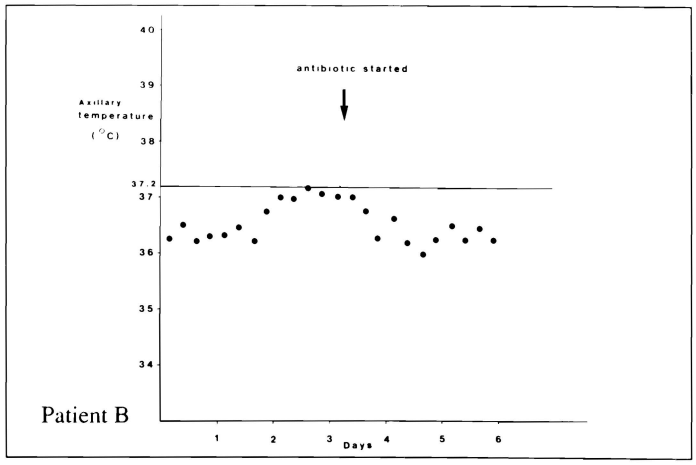


Figure II - Axillary temperature in two patients (A and B) showing a rise within the normal range upon developing pneumonia.

Patients with a WBC value below 10 x 10^9/L did not have a significantly higher risk of death (5/19), though all three of the patients with a WBC value below 4 x 10^9/L died. There was no concordance between a low (<10 x 10^9/L) WBC value and absence of a febrile response at the time of the diagnosis.

Blood cultures, sputum Gram stain and sputum culture

Eight (11%) of the blood cultures were positive (6 Strep. pneumoniae, 2 E.coli). This led to a change in treatment in one patient with amoxycillin resistant E. coli. No discernible relation was found between positive blood

Clinical Feature	number (%) with the feature	Deaths	p value
acute confusion	22 (31)	10	<0.05
acute incontinence	29 (41)	8	NS
recent falls	19 (27)	5	NS
recent immobility	25 (36)	8	NS
Long term immobility	18 (26)	11	< 0.05
dementia	8 (11)	5	< 0.05
history of chronic bronchitis	7 (10)	0	NS
recent onset of cough	38 (54)	6	< 0.05
sputum of recent onset	31 (44)	4	< 0.05
haemoptysis	4 (6)	0	NS
pleuritic chest pain	6 (9)	1	NS
dyspnoea	26 (37)	8	NS
bilateral chest crackles	45 (64)	12	NS
asymmetrical lung crackles	17 (24)	5	NS
bronchial breath sounds	14 (20)	3	NS
dullness to percussion	18 (26)	5	NS
central cyanosis (on air ; 21/23 had a PaO_2 of < 9.0 kPa .	23 (33)	13	< 0.05

Table I: The clinical features of 70 very old people with pneumonia

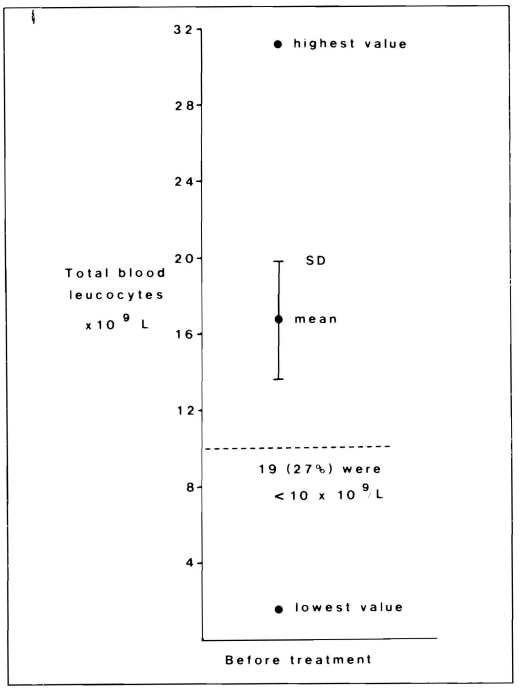


Figure III - Peripheral venous blood total WBC count at the time of diagnosis.

cultures and risk of death, RT, WBC, RR or any of the recorded clinical features.

Sputum Gram staining (31 patients) showed intracellular Strep. pneumoniae in 5 (16%) and Gram negative bacilli in large numbers in 4 (13%). Sputum culture provided potentially useful information on antibiotic sensitivity in these, and in a further 2 patients (1 E.coli, 1 Pseudomonas aeruginosa).

Sodium, Potassium and Urea

Twenty three patients (33%) had a mild to moderate hyponatraemia (Na^+ 125-135 mmol/l) at presentation, 17 of whom had been taking a diuretic. None of these needed fluid restriction to raise the Na^+ level and they did not have a higher risk of death (8 died). Four (6%) had moderate to severe hyponatraemia ($Na^+ < 125$ mmol/l). Three of these had simultaneous low serum and high urine osmolarities and were thought to have the syndrome of inappropriate antidiuretic hormone since none of these patients had glucose or urea abnormalities that could lead to physiological hyponatraemia of this degree. One of these died. Three (4%) were hypernatraemic ($Na^+ > 150$ mmol/l), though the Na^+ levels fell to normal when fluid replacement was given and none died.

Eight patients (11%) were hypokalaemic at presentation ($K^+ < 3.5$ mmol/l); six had been taking a diuretic and four of these were also hyponatraemic. One died. Five (7%) had serum K^+ levels > 5.5 mmol/l, one with a very high value of 6.9 mmol/l, who was also uraemic, died. Sixteen (23%) had a blood urea level above 15 mmol/l at the time of diagnosis, and though six (37%) of these died, this apparent increased mortality was not statistically significant. Two of those that died had very high levels of blood urea (> 40 mmol/l), with a history of chronic renal impairment.

Discussion

The presentation of pneumonia in the elderly patient is quite variable, frequently with a paucity of signs and symptoms. The aged may remain afebrile despite infection and even bacteraemia.[8] The rise in temperature can be very subtle. This study confirms that most very old people with pneumonia have a modest but a definite pyrexia. Furthermore, very old people with a habitually low body temperature should be considered to have a significant pyrexia if the AT rises by 1^0 C or more above the mean late afternoon value, even if the highest temperature does not exceed 37.4 ^{0} C; careful scrutiny of well kept ward temperature charts is very helpful in this context. In the absence of an adequate explanation for such an observation in an elderly individual, a chest radiograph should be performed to exclude pneumonia. In this age group small rises in body temperature should be sought by careful measurements and steps taken to detect and treat the cause as quickly as possible. Ideally, RT measurements should be taken,[4] and such a reading should always be part of the physical examination of an elderly person. A practical alternative for inpatients is to keep an AT chart and to consider readings above 37.0 ^{0} C as abnormally high, a contention which can be confirmed by taking a RT. Tachypnoea has been shown to be a valuable predictive sign of pneumonia in elderly people.[9] Patients with a raised (>25/min) RR or an RR chart showing a rising trend should always prompt a search for an explanation for that observation, and a recording of the RR should always form part of the physical examination of an elderly patient. Though body temperature and RR observations are not specific to the diagnosis of pneumonia, they are so frequently, albeit subtly, altered in this condition that they constitute the best available routine objective early warning of lower respiratory tract infection in very old people, where classical signs and symptoms of pneumonia are frequently absent.

However, pretreatment AT, RT and RR values do not help to identify the risk of fatality. Indeed, we found the clinical indices of fatality in this group of very old patients to be similar to those in a younger group of elderly people [2] (acute confusion, dementia, central cyanosis), with the addition of long-term inability to walk conferring a higher risk of death in the very old. Furthermore, the presenting clinical features which are commonly present in the young become progressively less frequent with age. For example, 54% of patients in this study complained of cough compared with 62% in a study of patients with a mean age of 82 years [2] and 93% in a study of patients with a mean age of 39 years.[5] The complaint of dyspnoea, however was no less frequent in this group than in the young, [5] though it was considerably lower than that reported in some studies of middle aged and elderly patients, [2,10,11,12] possibly because of under reporting of the symptom by the relatively high proportion of acutely confused and demented patients in this study.

This study also showed that most very old people with pneumonia exhibited a polymorphonuclear leucocytosis, though almost a third did not. Therefore, the finding of a total WBC count below 10 x 10^9/l does not mitigate against a diagnosis of significant lower respiratory tract infection in this age group.

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