

Pneumonia due to *Legionella pneumophila* and pneumococcal pneumonia: similarities and differences on presentation

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Pneumonia due to Legionella pneumophila and pneumococcal pneumonia: similarities and differences on presentation. A. Granados, D. Podzamczar, F. Gudiol, F. Manresa.

ABSTRACT: We compared clinical, radiological and laboratory data from 32 cases of community-acquired pneumonia due to *Legionella pneumophila*, with 37 cases of pneumococcal pneumonia (PP). This study revealed few clinical differences between the two types of pneumonia: in our experience Legionnaire's disease presents like a "typical" bacterial pneumonia. Given the difficulty of making a diagnosis on clinical data alone, we propose early aetiological diagnostic measures and recommend that the choice of initial treatment be based not only on the features at the time of presentation, but also on a consideration of the epidemiology of different types of pneumonia in a given area.

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Since the clinical features of Legionnaire's disease (LD), were first described in 1976, some authors have suggested that the pneumonia caused by this bacteria has distinct characteristics [1-3], while others emphasize the similarity between this type of pneumonia and those of other origins [4-5]. Between October, 1985, and September, 1986, we carried out a prospective study of the aetiology of community-acquired pneumonia requiring hospital admission. Our impression throughout the study was that clinical differences between pneumococcal pneumonia (PP) and LD were not evident on admission when antimicrobial therapy is initiated. We present a comparative study of the initial clinical, radiological and analytical characteristics of these two types of pneumonia, and their evolution following treatment.

Material and methods

During the study period, 226 patients were admitted to our hospital with a diagnosis of pneumonia. We have included data on 17 patients who were admitted in the first month after the study period, as this coincided with an outbreak. The causal agent of these 17 pneumonias turned out be *L. pneumophila*. After the study period, we reviewed the medical records of the 37 PP patients and 32 LD patients and compared the clinical characteristics they had shown on presentation. For the purpose of this study, patients with a probable but not definitive diagnosis of PP or LD were excluded.

Diagnosis of PP

Definitive aetiological diagnosis of PP. Isolation of *S.*

pneumoniae from blood and/or pleural fluid and/or material from percutaneous lung needle aspiration (PLNA).

Probable diagnosis of PP. Pure sputum culture for pneumococcus.

Diagnosis of LD

1. By indirect immunofluorescence antibody when titres were equal or superior to 1/128 in the serum in the acute phase of the disease or four times the initial titre in the convalescent phase and/or
2. By culture on BCYE-alpha medium with or without antibiotic supplement, from sputum, PLNA, bronchial brushing or bronchoaspirate samples.

Statistical analysis

Student's t-test was used to evaluate the differences between the two groups the quantitative variables. To evaluate the differences in the qualitative variables we used the Chi-squared test or Fisher's exact probability test when indicated.

Results

Figure 1 shows the aetiology of community-acquired pneumonias: cases not meeting the strict diagnostic criteria are included under "no cause".

Figure 2 shows the monthly distribution of pneumonia during the study period. Of the 32 cases of LD, 17

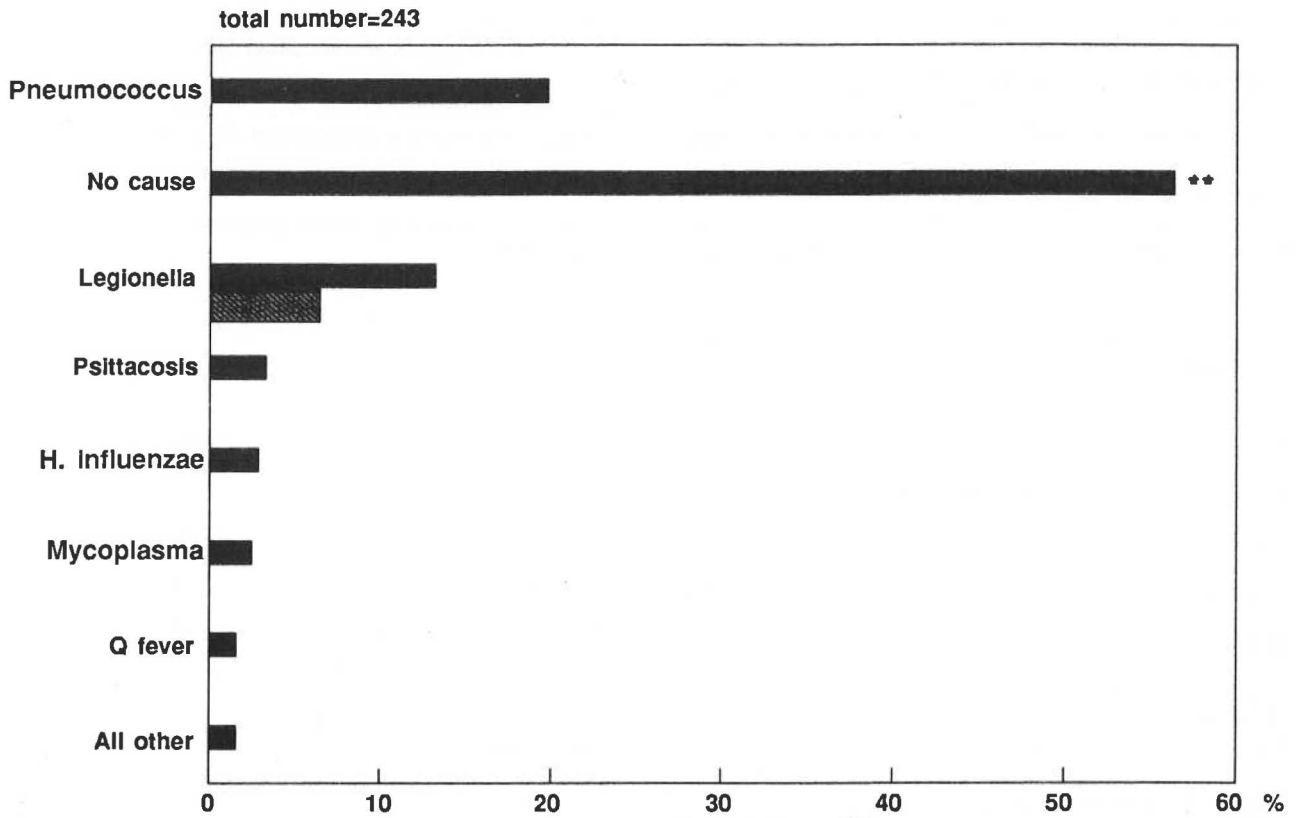


Fig. 1. - Aetiology of community-acquired pneumonia. Legionella: 1st value total cases, 2nd sporadic cases. **: 11 patients with pneumococcus as the predominant flora in the sputum; 79 patients with clinical picture of acute pneumonia with early and favourable response to penicillin.

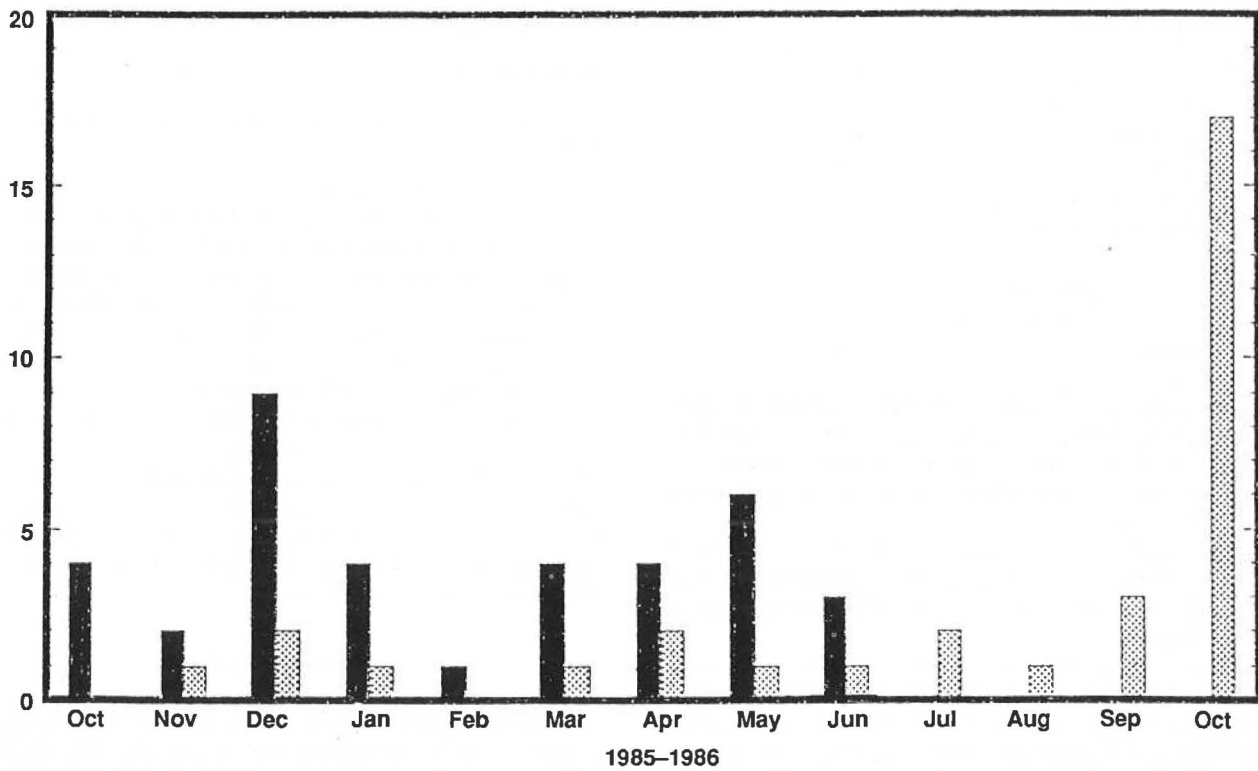


Fig. 2. - Pneumococcal and Legionella pneumonia. Distribution in months: ■: Pneumococcus (n= 37); ▨: Legionella (n= 32).

occurred during an outbreak in October 1986. PP was seen more frequently in winter and spring.

The general characteristics of the cases studied are given in table 1. Table 2 presents the characteristics of the 17 patients in the Legionella outbreak, which were similar to those of the general group of Legionella patients. Examination of medical records did not reveal any common area of residence or epidemiological factors. After questioning the patients retrospectively we are still unable to identify any possible common source.

Table 1. - General characteristics of 37 PP patients and 32 LD patients

	PP (n=37)	LD (n=32)	p value
Mean age [range] yrs	61 (26-86)	47 (22-71)	p=0.0002
Sex-males	24 (65)	28 (87)	NS
Smokers	16 (43)	23 (72)	p=0.0299
Heavy drinkers	7 (19)	11 (34)	NS
Underlying disease (% bronchopathy- immunosuppression)	27 (73)	18 (56)	NS
Previous β -lactam antibiotic therapy	13 (35)	29 (90)	p=0.000016

NS: not significant; PP: pneumococcal pneumonia; LD: Legionnaires' disease; (): %

Table 2. - Characteristics of the 17 patients in the Legionella outbreak

	No.	%
Mean age (range) yrs	48	(33-62)
Sex-males	14	82
Smokers	14	82
Heavy drinkers	7	41
Underlying disease (% bronchopathy- immunosuppression)	6	31
Previous β -lactam antibiotic therapy	13	76

From table 1 it can be seen that LD patients were younger, more frequently smokers and more of them had received previous β -lactam antibiotic therapy, in the following regimens: penicillin (9 patients for a mean of 3.6 days, range:2-5), amoxycillin (20 patients for mean of 3.3 days, range:2-5), ampicillin (3 patients for a mean of 2.6 days, range:2-3). Three of these patients had first received amoxycillin and then penicillin prior to coming to our hospital.

The semiology of the two groups is contrasted in table 3. Dyspnoea was more frequent in PP patients. Arthromyalgia was more frequent in LD patients and chest examination revealed no pleural involvement in this group, although in two cases slight pleural effusion was observed on chest X-ray.

Radiological and analytical characteristics are shown in table 4. PP patients more often showed pleural effusion on X-ray. Glutamate pyruvate transaminase (GPT) was more frequently raised in LD patients.

Figure 3 shows the treatment given to all cases on admission and their subsequent evolution. Eight (25%) of

Table 3. - Presenting clinical characteristics of PP and LD patients

	PP (n=37)	LD (n=32)	p value
Previous days of illness (range)	4 {1-7}	5 {1-10}	NS
Fever >38°C	37 (100)	32 (100)	NS
Headache	5 (13)	9 (28)	NS
Chills	21 (57)	21 (66)	NS
Chest pain	27 (73)	16 (50)	NS
Dyspnoea	25 (68)	13 (41)	p=0.0428
Cough	33 (89)	25 (78)	NS
Purulent expectoration	15 (40)	7 (22)	NS
Arthromyalgias	5 (14)	13 (41)	p=0.0213
Confusion	5 (14)	8 (25)	NS
Diarrhoea	4 (11)	6 (19)	NS
Crepitations	31 (84)	27 (84)	NS
Bronchial breathing	14 (38)	6 (19)	NS
Pleural semiology	9 (24)	0	p=0.0022

NS: not significant; PP: pneumococcal pneumonia; LD: Legionnaires' disease; (): %.

the 32 LD patients were prescribed β -lactam antibiotics in the accident and emergency department as the clinical picture was interpreted as a probable pneumococcal pneumonia. In these 8 patients the antibiotic was changed to erythromycin when patients were still febrile 48 or 72 h after admission and/or when X-ray changes tended to progress. Six of them responded favourably while two of the three requiring intensive care died. No difference in evolution was seen between these patients and those initially treated with erythromycin.

Erythromycin was initially administered to 14 (38%) of the 37 patients with PP and was changed to penicillin in 11 cases once bacteriological results were known. Erythromycin was continued in three patients who were allergic to β -lactam antibiotics.

Discussion

These results show that in most cases LD behaves like a "typical" bacterial pneumonia. Initial clinical, radiological and analytical differences were of little relevance; rather, it was the occurrence of cases during a Legionella

Table 4. – Radiological and laboratory characteristics on presentation

	PP (n=37)	LD (n=32)	p value
Alveolar pattern	37 (100)	32 (100)	NS
Interstitial pattern	0	1 (3)	NS
Lobar pneumonia	24 (65)	18 (56)	NS
Bilobar unilateral	10 (27)	8 (25)	NS
Pneumonia bilateral	3 (8)	7 (19)	NS
Pleural effusion	9 (24)	2 (6)	p=0.0404
Cavitation	4 (11)	0	NS
White cell count >10,000·mm ⁻²	25 (68)	19 (59)	NS
Po ₂ mean, mmHg	56.3±12.3	59.8±13.4	NS
Pco ₂ mean, mmHg	32.3±7.0	30.9±6.4	NS
Urea mean, mmol·l ⁻¹	12.6±9.1	8.4±5.8	NS
Sodium <130 mmol·l ⁻¹	1/35 (3)	5/30 (17)	NS
Elevated GPT	13/35 (37)	23/30 (77)	p=0.0012

NS: not significant; PP: pneumococcal pneumonia; LD: Legionnaires' disease; Po₂, Pco₂: oxygen and carbon dioxide tensions, respectively; GPT: glutamate pyruvate transferase; (): %; ±: SD.

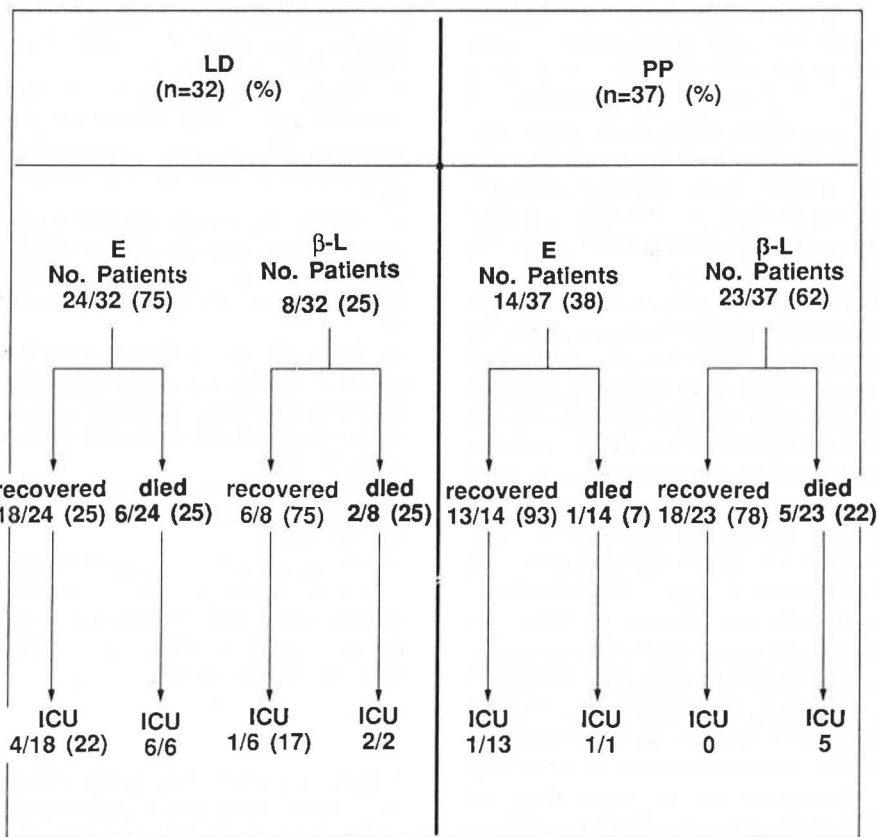


Fig. 3. – Treatment and evolution of Legionnaires' disease (LD) and pneumococcal pneumonia (PP) cases. E: Erythromycin; β-L: β-lactam antibiotics; ICU: intensive care unit.

outbreak and previous β-lactam therapy which led us to suspect LD.

The distinctive classical signs observed by some authors [1–3] such as confusion or encephalopathy, headache, non-productive cough and diarrhoea were not more frequent in our LD patients than in those with PP, a finding also observed by YU *et al.* [4]. Despite the fact that WOODHEAD and MACFARLANE [5] report a greater number of differences between the two types of pneumo-

nia, they too conclude that neither seems to exhibit a characteristic pattern and are therefore difficult to distinguish in practice. These authors advise a different empirical treatment regimen (ampicillin or amoxycillin plus erythromycin) from our own, perhaps because they see a different pattern of community-acquired pneumonia - they cite *Haemophilus influenzae* as the second most common cause [6].

Like other authors [7] we cannot distinguish between

the two aetiologies solely by radiography; however, in our study, the presence of pleural effusion was significantly more frequent in patients with PP.

On laboratory analysis, only GPT was significantly higher in LP patients, a finding in common with most others studies [1-3, 5]. Clearly this fact is not specific enough to allow us to suspect LD, particularly when 37% of patients suffering PP also present with raised GPT.

Given that the clinical, radiological and biological characteristics of LP are nonspecific, we stress the importance of using early diagnostic methods: techniques of direct immunofluorescence (DIF) [8, 9], antigen detection [9] and/or cultures [9, 11, 12] of sputum samples or material obtained by invasive techniques such as PLNA, bronchial brushing or bronchoaspirate methods in selected cases.

Ninety per cent of LD patients had received β -lactam antibiotics before reaching our centre, and 25% were again administered the drug following admission. This underlines the difficulty of differentiating the two pneumonias on clinical grounds alone and supports the predictive value of failure to respond to β -lactam antibiotics in guiding diagnosis towards LD. A delay of approximately 2-3 days in administering erythromycin due to incorrect clinical diagnosis (eight of 32 patients) did not influence the subsequent evolution of these cases compared with those who received erythromycin from the first day of admission. However, with such a small number of cases this fact must be interpreted with caution.

Our results might be taken to indicate that the treatment of choice in community-acquired pneumonia in our area should be erythromycin; however, PP continues to be the most frequent cause (20%) and although *Legionella* is the second, sporadic cases account for only six per cent. It should also be pointed out that of the pneumonias which could not be identified bacteriologically, most presented with a clinical picture of acute pneumonia (see fig. 2) with a fast and favourable response to penicillin. Finally, we should not forget that treatment with erythromycin is more expensive than with penicillin.

For these reasons in everyday practice our policy on community-acquired pneumonias, which require admission, is to use the early diagnostic measures mentioned until a definitive diagnosis is reached. Meanwhile, patients with characteristics "typical" of bacterial pneumonia receive penicillin, and patients who do not present with the "typical" clinical picture or where there are epidemiological antecedents (previous β -lactam antibiotics or an outbreak) receive erythromycin. For a grave pneumonia we administer erythromycin plus cefotaxime so as to cover not only *Str. pneumonia* but also *Legionella*, bacteria causing atypical pneumonias, *H. influenzae* (the fourth cause of pneumonia in our community - see fig. 2), and other gram-negative bacteria. When planning treatment it is important to know the aetiology and frequency of pneumonias seen in a given community, rather than adopt recommendations from other areas where the epidemiology may be quite different.

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RÉSUMÉ: Nous avons comparé les données cliniques, radiologiques et de laboratoire, dans 32 cas de pneumonie acquise dans la collectivité et due à *Legionella pneumophila*, avec celles de 37 cas de pneumonie pneumococcique. Cette étude a révélé peu de différences cliniques entre les deux types de pneumonie. Dans notre expérience, la maladie des légionnaires se présente comme une pneumonie bactérienne typique. Vu la difficulté de diagnostic sur la base de données cliniques isolées, nous proposons la recherche précoce de l'agent causal, et recommandons que le choix du traitement initial soit basé, non seulement sur l'aspect clinique, mais aussi en prenant en considération l'épidémiologie des différents types de pneumonie dans une zone déterminée.

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