PNEUMOCYSTIS CARINII PNEUMONIA

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PNEUMOCYSTIS carinii pneumonia, or interstitial plasma cell pneumonia, as it was previously named, is a highly infectious disease well known on the continent of Europe where it is endemic and on occasion, epidemic. This paper reports a case seen in the British Military Hospital, Munster, Germany, and briefly describes the condition as seen in civilian practice in a German population and reviews some of the literature.

Aetiology

The casual organism is the protozoan parasite *Pneumocystis carinii* and it was first established as the cause of the pneumonia of that name in a child by Van de Meer and Brug in 1942. Since then it has been demonstrated in innumerable fatal cases of the disease. The parasite was first discovered by Chagas in 1909 and studied by Carini in 1910. There is considerable controversy regarding the nature of the infecting agent. Most people believe it to be a protozoan (Jirovec and Vaněk, 1954), some believe it to be a yeast, and yet others suggest the aetiological agent to be a virus with *Pneumocystis carinii* as a secondary invader (Weisse, 1949). The infectious nature of the disease, the failure to culture a bacterial pathogen, the non-response to antibiotics and antimycotics and the minimal leucocyte response to infection favour a virus aetiology, but the evidence favouring the *Pneumocystis carinii* parasite as the aetiological agent in this peculiar pneumonia, primarily in its regular demonstration in the lungs of fatal cases is formidable, and further evidence in the form of a complement fixation test has been developed (Barta, Dvořáček and Kadlec, 1955).

Pathogenicity and Epidemiology

Although cases have been reported mainly from Europe, in recent years the disease has been recognised in many countries, suggesting that it is world wide in distribution and much more common than is appreciated. It is primarily a disease of institutions and hospitals and may effect all age groups but with a marked predilection for premature and debilitated children (Deamer and Zollinger, 1953). The disease does occur in fully developed children, but even so, many authors have drawn attention to the fact the peak incidence is at three to four months when the maternal antibodies to proven pathogens are at lowest ebb. It has been described in still born children (Pavlica, 1962) and has been related to sudden and unexpected deaths in children (Sheldon, 1959). The mode of transmission of the disease is not understood.

Other factors which appear to be significant in the pathogenicity and virulence of the organism in all age groups include prolonged corticosteroid or antibiotic therapy, hypogammaglobulinaemia and prolonged debilitating illness.

Many of the cases reported outside Europe have been associated with deficiency of gammaglobulin and necroscopy material from such cases have shown deficiency of plasma cell reaction in the lungs (Russell, 1959). There are no seasonal features in the incidence of the disease.

A survey of sixty-seven cases of *Pneumocystis carinii* pneumonia treated in the University Kinderklinik, Münster, during the years 1957 to 1962, demonstrated the preponderance of cases occurring in institutions as opposed to private residences and a mortality of twenty-five per cent (Table I). One institution outside Münster provided a steady source of cases until 1962 when an attendant nurse was found to have a positive complement fixation test. No further cases occurred following her dismissal.

TABLE I

Year	Number of Cases	Number of patients admitted from		Outcome	
		Institutions	Private Residences	Died	Recovered
1957	12	7	5	2	10
1958	10	8	2	3	7
1959	17	9	8	4	13
1960	10	6	4	3	7
1961	11	7	4	5	6
1962	7	7	—	2	5
1957 to 1962	67	44 = 65.7 per cent	23 = 34.3 per cent	19 = 28.4 per cent	48 = 71.6 per cent

Clinical Features

In many instances a history of mild gastro-intestinal upset may precede the actual illness, which is itself characterised by severe progressive tachypnoea and dyspnoea with marked use of accessory muscles of respiration and abdominal breathing. Usually there is no fever and physical signs are few. Breath sounds may be normal or there may be areas of moist crepitations and bronchial breathing in the lungs.

The child develops a peculiar grey cyanosis with a harsh, grunting, unproductive cough, often simulating pertussis, for which the disease is sometimes mistaken, and this is often accompanied by a look of acute apprehension which is itself typical.

The blood picture is unhelpful but may show a moderate leucocytosis. X-ray shows a diffuse ground glass or mottled appearance in the lungs spreading out from the hilar regions, and there may be contiguous areas of collapse and emphysema giving an appearance which has been described as "halo" emphysema. The disease is often fatal, the mortality being about twenty-five per cent (Gajdusek, 1957).

Diagnosis

The diagnosis is essentially a clinical one, procedures such as complement fixation tests or lung puncture being impracticable as a rule.

Therapy

No specific therapy is known. Sulphonamides, antibiotics, antifungal agents (nystatin), corticosteroids, antiprotozoal agents, (chloroquine, emetine), and gammaglobulin have been tried without success. Oxygen and humidity appear to be the only help-

ful modes of therapy. Pentavalent antimony compounds and aromatic diamidines are probably worthy of further trial, (Marshall et al, 1964) as may also be alkaloids of ergot (Personal observation B.S.S.-J).

Case Report

A ten-week old English male child was admitted to British Military Hospital, Münster, because of vomiting and refusal of feeds during the previous week. His doctor had noted recent onset of respiratory difficulty consisting of noisy respiration with lower costal recession and attacks of fighting for breath accompanied by a peculiar harsh, grunting cry. A premature baby, weighing four pounds at birth, he had been delivered in a local German hospital, where he had stayed for six weeks because of slow weight gain, birth and development had been otherwise normal.

On admission the child appeared well and was crying lustily, but he weighed only 8 lbs, and had severe tachypnoea. He was not cyanosed but around the mouth was a striking bluish pallor and there was marked lower sternal and lower costal recession on inspiration.

Clinical examination showed a paucity of physical signs which was at variance with the obvious respiratory difficulty and suggested obstruction at the alveolar-capillary level. The following day the child improved but he later relapsed. He developed a generalised greyish cyanosis in spite of being in an oxygen tent, mouth and eyes were open and he developed a frightened apprehensive look and each breath became a gasping tortured struggle for oxygen. Respirations increased to 80 and pulse rate to 180 per minute but the temperature remained normal. He died four days after admission from what appeared to be slow suffocation. Penicillin, methicillin and streptomycin were given without benefit. The blood picture showed a moderate leucocytosis but urine and cerebrospinal fluid were normal. Chest x-ray showed a finely mottled appearance located particularly in the upper lung fields (Figure 1).

Autopsy Findings

Both lungs showed subpleural emphysematous bullae and on section the borders of the lung stood out prominently and the cut surface showed shiny firm areas which appeared to be fibrotic. The bronchi contained only a little mucus and no pus. Culture taken from lung tissue did not reveal any significant organism and viral studies were negative.

On microscopy the alveolar walls were seen to be engorged and heavily infiltrated with macrophages, lymphocytes, atypical lymphocytes and a high proportion of plasma cells; some interstitial fibrosis was present. Occasional giant cells with periodic-acid-Schiff positive cytoplasm were seen. The terminal alveoli were filled with a foamy exudate containing masses of the parasites. The interstitial tissue was densely infiltrated. The abundance of plasma cells suggests this case was not associated with hypogammaglobulinaemia. With large magnification masses of parasites could be seen in the terminal alveoli. (Figure 2).

A lung imprint, taken from fresh lung tissue in another fatal case and stained with WRIGHT'S stain, shows a small cyst of the parasite. The cyst contains 8 nuclei each surrounded by a light stained halo. (Figure 3).

Fig. 1

Conclusions and Summary

Pneumocystis carinii pneumonia is a parasitic pneumonic disease seen usually in children during the first six months of life, coming to light under conditions of lowered host resistance, such as prematurity and deficiency of serum gammaglobulin. In older children and adults the disease may complicate prolonged illness or prolonged corticosteroid therapy. It has been noted in children dying sudden and unexpected deaths.

The diagnosis must be considered in the presence of the clinical picture described, particularly when there is no response to antibiotic therapy. No specific therapy is known for this disease although pentamidine intramuscularly has been successful in some recent cases.

A fatal case occurring in a British child in Germany is here reported and the clinical and pathological features are described.

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Fig. 2

Fig. 3

REFERENCES

- BARTA, K., DVOŘÁČEK, C. and KADLEC, A. (1955). *SCHWEIZ. Ztschr. allg. Path.* **18**, 22.
 CARINI, A. (1910). *Comm. Soc. Med. Sao Paulo.* **16**, 204.
 CHAGAS, C. (1909). *Mem. Inst. Oswaldo Cruz. Rio.* **1**, 159.
 Cited by Gadjusek, D.C. (1957) in pediatrics. **19**, 543.
 DEAMER, W. C. and ZOLLINGER, H. V. (1953). *Pediatrics.* **12**, 11.
 GAJDUSEK, D. C. (1957). *Pediatrics.* **19**, 543.
 JIROVEC, A. and VANEK, J. (1954). *Zentralbl. Allg. Path.* **92**, 424.
 MARSHALL, W. C., WESTON, H. J. and BODIAN, M. (1964). *Arch. Dis. Childh.* **39**, 18.
 PAVLICA, F. (1962). *Ann. Paediat. (Basle).* **198**, 177.
 RUSSELL, J. C. B. (1959). *Arch. Dis. Childh.* **34**, 338.
 SHELDON, W. H. (1959). *Amer. J. Dis. Child.* **97**, 287.
 VAN DE MEER, Mlle. G. and BRUG, S. L. (1942). *Ann. Soc. Belge. Med. trop.* **22**, 301.
 WEISSE, K. (1949). *Z. Kinderheilk.* **67**, 54.

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