

Late-onset post-pneumonectomy empyema¹

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Kerr, W. F. (1977). *Thorax*, 32, 149–154. **Late-onset post-pneumonectomy empyema.** Nine cases of empyema developing more than three months after pneumonectomy are presented. Diagnosis is difficult; with one exception, all the patients had been ill for at least three weeks and some for several months before the cause was discovered. In four, the radiological demonstration of gas in a previously opaque hemithorax led to the diagnosis. One of these had a bronchial fistula, two had oesophageal fistulae, and one had both. The remaining patients had no fistulae and the diagnoses were not made until empyema necessitatis had developed. Two from this group yielded pure cultures of pneumococci and one a pure culture of *Streptococcus viridans*. Except for one patient admitted moribund, all were treated in the first instance by rib resection and open drainage without tubes and all survived. Four of the five without fistulae subsequently had their drainage sinuses successfully closed after the infection of the chest wall had cleared.

The belief that a pneumonectomy space normally becomes obliterated is challenged. The history and mode of onset of some of these cases suggested that infection of the residual fluid was bloodborne.

Eighty years ago, in 1895, the first man to survive removal of a lung was operated on in Glasgow in the Western Infirmary by the Regius Professor of Surgery, Sir William Macewen. The operation was anything but the formal procedure routinely practised today. Tuberculosis and superadded secondary infection had destroyed the lung and even, it seems, sealed the bronchus. Macewen evacuated a huge intrapulmonary abscess, dissected out the sloughs and remnants of lung adherent to chest wall and mediastinum, and left the chest with wide-open drainage (Macewen, 1906). Later he dealt so successfully with the infected space by thoracoplasty and turning in a skin flap that 45 years afterwards, during the second world war and at the age of about 70, the patient was fit for an elective operation for hernia which he underwent in the hope and expectation of being able to get back to work (Bowman, 1942). The first successful pneumonectomy for cancer was also followed by empyema (Graham and Singer, 1933) and that patient too survived, with a thoracoplasty, for many years.

Today, in the antibiotic era, infection of a pneumonectomy space is still an occasional hazard as several recent articles testify (Clagett and

Geraci, 1963; Provan, 1971; Adler and Plaut, 1972; Holden and Wooler, 1972; Stafford and Clagett, 1972; Bhattacharya *et al.*, 1973; Zumbro *et al.*, 1973; Virkkula and Eerola, 1974; Kärkölä *et al.*, 1976). Most cases occur early and are recognised and treated before the patients leave hospital. A late-onset empyema may be arbitrarily defined as one which first produces symptoms or signs more than three months after the resection in a patient whose immediate postoperative course gave no cause for concern. Almost every report includes one or two examples, 26 years being the longest interval (Stafford and Clagett, 1972), but the late cases tend to be lost among the much more numerous early ones, on which attention is naturally focused. There seems as a result to be a widespread belief that once a patient has recovered well from the operation and the hemithorax has filled as expected, complications in the form of space infections have been avoided and can be forgotten. The purpose of this paper is to concentrate attention on the late infections which are not so very uncommon.

Cases

The Table summarises the relevant features of nine cases encountered in the seven years January 1968 to December 1974.

¹Based on a paper read to The Society of Thoracic and Cardiovascular Surgeons of Great Britain and Ireland: Glasgow, September 1975

Table Details of nine cases of late-onset post-pneumonectomy empyema, 1968-74

Patient	Sex/Age at pneumonectomy/ Lung lesion	Pneumonectomy to onset of illness	Clinical presentation	Onset of illness to diagnosis of empyema	Diagnosis made by	Fistula	Bacteriology of pus	Treatment	Comments
JW	M 68 yr Carcinoma	52 mth	Empty space noted at routine follow-up 22 mth after pneumonectomy. Remained asymptomatic for another 30 mth then recurrent pneumonitis Cough; dysphagia	—	Gas on chest radiograph	Bronchial	No record	Permanent open drainage	Comfortable and content 2 yr later. Cardiac failure and chronic bronchitis preclude major surgery
RT	M 62 Carcinoma	8 mth		4 mth	Gas on chest radiograph	Bronchial and oesophageal	Mixed organisms	Closed intercostal drainage	Mediastinal recurrence of carcinoma. Moribund on admission; died soon afterwards
MR	F 56 Carcinoma	32 mth	Rigors; intermittent pyrexia	3 wk	Gas on chest radiograph	Oesophageal	Mixed organisms	(1) Open drainage (2) Subcutaneous colon bypass of oesophagus	Mediastinal recurrence of carcinoma causing dysphagia 6 mth after drainage of empyema. Died from respiratory obstruction 6 mth after second operation
KS	M 34 Tuberculosis	13 yr	'Influenza' followed by debility and refractory anaemia	12 mth	Gas on chest radiograph	Oesophageal	Mixed organisms; repeatedly Tb -ve	(1) Open drainage (2) Subcutaneous colon bypass of oesophagus (3) Closure of cervical anastomotic leak	Fistula in traction diverticulum adherent to lower end of bronchial closure. No bronchial fistula
AN	M 63 Carcinoma	14 mth	Nausea, vomiting	3 wk	Empyema necessitatis	None	Pneumococcus	Permanent open drainage	Comfortable and content 4½ yr later. Refuses to have sinus closed
HD	M 58 Carcinoma	8 mth	Pyrexia, debility	5 mth	Empyema necessitatis	None	No record	(1) Open drainage (2) Closure of sinus	Died of myocardial infarction 1 yr after closure of sinus.
HG	M 62 Carcinoma	27 mth	'Influenza'	3 mth	Empyema necessitatis	None	Pneumococcus	(1) Open drainage (2) Closure of sinus	Fluid in chest sterile 1 mth before death
JF	M 59 Carcinoma	4 mth	Bronchopneumonia (radiologically confirmed)	2 mth	Empyema necessitatis	None	<i>Strep. viridans</i>	(1) Open drainage (2) Closure of sinus	Well 7 yr after sinus closed
RD	M 59 Carcinoma	36 mth	'Pneumonia'	1 mth	Empyema necessitatis	None	No growth	(1) Open drainage (2) Closure of sinus	No recurrence of empyema or bronchial carcinoma 8 yr after closure of sinus, but patient ill with congestive cardiac failure and carcinoma of prostate

Discussion

All but one of the nine patients were men and all but one had cancer, the other tuberculosis. In none had there been anything alarming in the immediate postoperative course or, looking back, anything that might have given a hint of trouble brewing. The Table indicates how long after the resection each patient remained clinically satisfactory—four months to 13 years—and how long each was ill before empyema was diagnosed—three weeks to one year. The patient KS had a short febrile illness 15 months after the pneumonectomy when antituberculosis drugs had been discontinued, but he recovered without treatment in under two weeks and the fluid in his pneumonectomy space was proved sterile at the time. Another patient (JW) had no premonitory illness; at routine review 22 months after pneumonectomy, the chest radiograph showed an empty space where previously there had been an opaque hemithorax. It was two years after that that he had the first of a series of infections in the other lung indicative of a bronchial fistula not apparent on bronchoscopy.

Gas appearing on a chest radiograph that had previously shown a normal postoperative opacity led to the diagnosis in four cases and all were eventually proved to have bronchial or oesophageal fistulae communicating with the pleural cavities. One (JW) has already been mentioned. Another (KS) was the patient who fell ill 13 years after pneumonectomy for tuberculosis. After

drainage of the empyema, repeated attempts to demonstrate a bronchial fistula failed but two years later an oesophageal fistula was discovered; it showed only when he was examined lying down (Fig. 1). At that time he firmly denied any oesophageal symptoms but a few months later clinical corroboration was forthcoming.

The other two, with gas in their pneumonectomy spaces, were the only patients known to have recurrent carcinoma. RT, moribund on admission, had obvious tumour in the bronchial stump and adjacent oesophagus, with a fistula into the pleural cavity from each. The other (MR) first complained of dysphagia some six months after the empyema had been drained and only then was the cause of the empyema discovered—a minute oesophageal fistula (Fig. 2). Oesophageal obstruction from mediastinal recurrence of bronchial carcinoma is common enough but oesophagopleural fistula occurring late seems to be rather rare. Symes *et al.* (1972) reported one case and claimed that it was unique.

The five cases which did not have fistulae had all progressed to empyema necessitatis before they were recognised. Pneumococci in pure culture were isolated from two, *Strep. viridans* from one, and there was no growth from another. In two (HG and RD) the illnesses started during influenza epidemics. All had had antibiotics at home or in hospital beforehand.

In this series, as in others, delay in diagnosis was the rule rather than the exception. One cause of difficulty is that late-onset post-pneumonectomy



Fig. 1 KS Barium swallow in recumbent position shows a traction diverticulum of the oesophagus with a fistula between it and the pleural cavity.



Fig. 2 MR Barium swallow showing oesophageal involvement in mediastinal recurrence of carcinoma of lung 38 months after pneumonectomy. A thin thread of barium running from the upper third of the stricture horizontally to the left indicates the fistula communicating with the empyema cavity.

empyema seldom presents with the classical signs of 'pus somewhere'. Only two of the nine did so (MR and HD); the rest just felt 'out of sorts' and some did not even have a leucocytosis. Before the empyemas declared themselves in unmistakable terms, the single indication that the pneumonectomy side was the seat of the trouble was shift of the tracheal translucency on the chest radiograph back towards the mid-line. That occurred in only one patient and not until he had been ill for a year, so it hardly qualifies as a reliable early sign.

Another reason for not suspecting empyema sooner appears to be a belief that after a time there is no space to become infected. It is a belief that Clagett and Geraci (1963) did nothing to dispel when they wrote in the introduction to their important and widely quoted paper on the treatment of post-pneumonectomy empyema that

the 'accumulated fluid clots and eventually becomes a solid fibrotic mass'. In my experience, the fibrous reaction stops short of obliteration and even after many years encloses a lacuna of clear fluid, a 'target' for circulating bacteria. Figures 3 and 4 indicate how much fluid two patients harboured 33 months and 14 years respectively after pneumonectomy. Once it is generally realised that the clinical and radiographic signs on the operation side are accounted for in part by fluid, and that that fluid always remains liable to infection, diagnostic aspiration is likely to be more widely practised when a patient who has had a lung removed falls ill for no apparent reason. Chest aspiration was attempted before the diagnosis was obvious in only one case in this series (HD), and the procedure was left to an inexperienced junior. When a 'dry tap' was reported, the patient was considered to be suffering from 'carcinomatosis', and it was not until the empyema broke through the chest wall three months later that the real cause of the illness was discovered. KS, who complained for a year of lassitude, debility, and

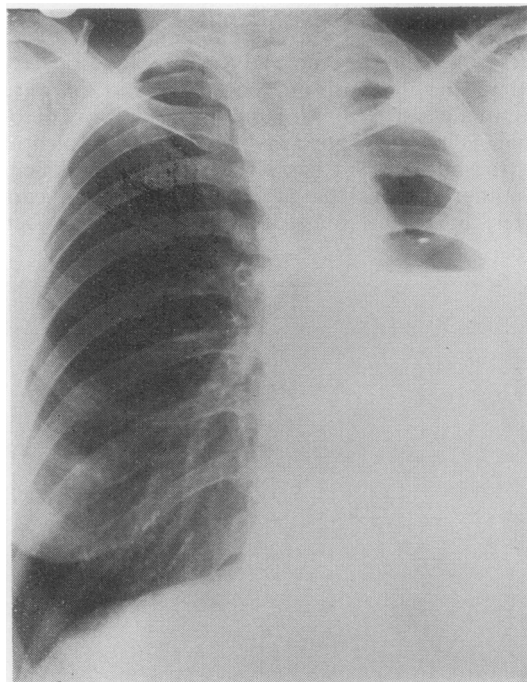


Fig. 3 MR Chest radiograph before drainage of empyema showing the late accumulation of gas in a side that had previously been completely opaque. Note the size of the space 33 months after pneumonectomy and three weeks after the acute onset of fever.

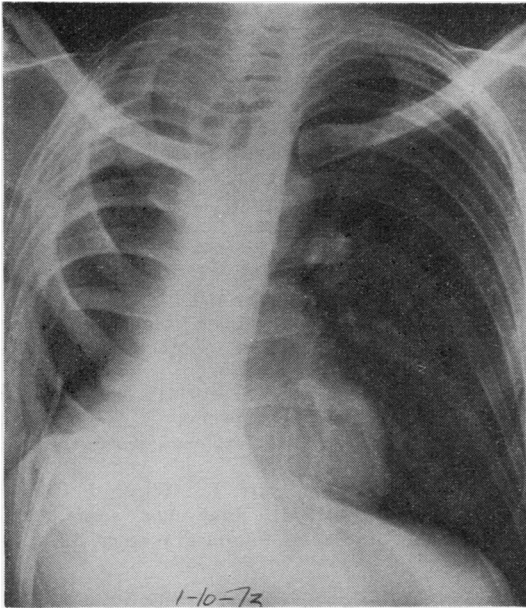


Fig. 4 KS Chest radiograph after rib resection and open drainage showing the hemithorax far from solid 14 years after pneumonectomy and one year after the insidious onset of empyema.

intractable anaemia had in that time every conceivable haematological, bacteriological, radiological, and biochemical investigation, but aspiration of the chest was not attempted until the diagnosis had become plain from the change in radiographic appearances.

The source of infection in those patients without fistulae is debatable. Even in very late cases it is not impossible that the organism was liberated or implanted during the operation and smouldered away in bronchial stump or chest wall suture until perhaps a small abscess ruptured into the cavity and infected its contents. On the other hand, foreign bodies, scar tissue, and isolated pockets of fluid are well-known 'targets' for circulating bacteria, and pneumonectomy provides them all. It might be significant that both the pneumococcal cases occurred during influenza epidemics and the streptococcal case after radiologically confirmed bronchopneumonia. Holden and Wooler (1972) reported a case of empyema of the pneumonectomy space that occurred soon after appendicitis with peritonitis, and the same type of organism, *Bacteroides*, was recovered from the pleural cavity as had earlier been isolated from the peritoneum. Subphrenic abscess as the route of infection was ruled out by postmortem examination. It would seem therefore that blood

spread is a distinct possibility as a cause of late-onset post-pneumonectomy empyema.

The primary treatment of all cases except that of the moribund man was open drainage without a tube, as advocated by Clagett and Geraci (1963) and Stafford and Clagett (1972). Nothing more is planned for the patient with the non-malignant bronchial fistula (JW), now too old and feeble for major surgery. The woman with tumour recurrence in the mediastinum and an enlarging oesophageal fistula had the discharge from her chest reduced to tolerable quantities by a palliative subcutaneous colon bypass of the oesophagus, and she died of tracheal obstruction six months later. The man with the non-malignant oesophageal fistula has had a similar oesophageal bypass operation and has been able to return to sedentary work.

Four of the five patients who did not have fistulae had their sinuses closed at varying intervals after the establishment of open drainage, following precisely the procedure described by Clagett and Geraci (1963). One of these (HD) died of myocardial infarction a year later. The fluid in his chest was proved sterile a month before death. Two (HG and JF) are alive and well at five and seven years respectively after closure of their sinuses, and the fourth (RD) has survived eight years without recurrence of empyema or bronchial carcinoma but is far from well with heart disease and carcinoma of the prostate. The one patient without a fistula who has not had his sinus closed (AN) has many times refused offers of further surgery. The scant discharge from his chest and the daily dressing inconvenience him so little that he considers another operation not worth while.

Conclusions

Late-onset post-pneumonectomy empyema is an infrequent cause of refractory illness in patients who have had uncomplicated pneumonectomies and one that is liable to be overlooked. The diagnosis can be confirmed or excluded by aspiration of the residual pocket of fluid. Permanent open drainage without a tube is a convenient, comfortable, and satisfactory way of treating patients with fistulae; thoracoplasty is not necessary. A patient without a fistula may have the drainage sinus closed, once the chest wall infection has settled, with excellent prospects of a good long-term result.

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