SUDDEN OPERATIVE DEATH DUE TO MASSIVE TUMOUR EMBOLISM

BY

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In the following case death due to massive neoplastic embolism occurred during operation for a tumour of the right lung. The tumour was later shown to be a metastatic deposit from an adrenal cortical carcinoma.

Case Report

A housewife aged 56 complained of persistent cough following a febrile illness in February, 1953. At first she had a little clear sputum, but soon she began to have

FIG. 1

FIG. 2

FIGS. 1 and 2.—Postero-anterior and right lateral radiographs of chest taken on July 30, 1953, showing tumour in middle lobe of right lung.

repeated small haemoptyses. She had lost a few pounds in weight, had become progressively more breathless on exertion, and complained of loss of energy. She was admitted to hospital in August, 1953.

On examination there were no abnormal physical signs. Radiography revealed an opacity in the middle lobe of the right lung (Figs. 1 and 2). Fluoroscopy showed normal diaphragmatic movements, and a barium swallow showed no oesophageal deformity. At bronchoscopy a cauliflower-like projection was seen at the middle lobe orifice, but biopsy was inconclusive. A diagnosis of bronchial carcinoma was made. The tumour increased appreciably in size in the three weeks before operation.

On August 28, 1953, right posterolateral thoracotomy was performed through the bed of the resected sixth rib. There was a large tumour mass in the middle lobe. Numerous enlarged lymphatic nodes were present around the right bronchus. The right superior pulmonary vein felt a little indurated. The right main bronchus was clamped, the superior pulmonary vein was identified, and dissection of the right main pulmonary artery was started. At this stage cardiac arrest was noticed.

The pericardium was opened and rhythmic cardiac compression was begun. No further spontaneous cardiac action occurred. No effective filling and emptying of the cardiac chambers could be achieved, and after 45 minutes, by which time the myocardium was flaccid, cardiac compression was abandoned.

At necropsy a circumscribed tumour was present in the middle lobe of the right lung. The middle-lobe bronchus was invaded and obstructed by tumour, and extension of the tumour had occurred into the submucosa of the right main bronchus. The hilar lymphatic nodes were extensively invaded by growth. Friable growth was firmly attached to the wall of the right superior pulmonary vein and filled its lumen. The right heart chambers were normal. The left atrium and left ventricle contained fragments of growth up to 1 cm. in diameter. The ascending aorta contained numerous fragments of growth up to 2 cm. in diameter. The innominate artery and the left common carotid artery were occluded by similar fragments.

The left adrenal gland was replaced by a pale tumour, 15 cm. in diameter. On section the tumour was soft, with areas of haemorrhage and necrosis.

The right adrenal gland contained a similar tumour, 7 cm. in diameter. There was a small deposit in the spleen.

FIG. 3.—Embolus in innominate artery. (H. and E. $\times 56$.) This is composed entirely of tumour tissue.

FIG. 4.—Pleomorphic tumour in left adrenal gland. (H. and E. $\times 110$.) Numerous tumour giant cells are shown.

Microscopically the emboli in the heart and great vessels were found to consist entirely of tumour identical with that in the lung and adrenal glands (Fig. 3). The histological appearances were those of carcinoma of the adrenal cortex (Fig. 4).

Discussion

There have been several reports of death due to obstruction of the pulmonary arterial circulation by large tumour emboli. Some of these deaths occurred "spontaneously" in the absence of any operation upon the primary tumours (Table I). There have also been reports of cases in which death has resulted from massive neoplastic embolism involving the systemic arterial system (Table II).

TABLE I.—*Reports of Deaths Due to Pulmonary Neoplastic Embolism*

Authors	Site of Primary Growth	Relation of Death to Operation
Judd, E. S., and Scholl, A. J., 1924, <i>J. Amer. med. Ass.</i> , 82 , 75	Kidney	Half an hour after operation
Warren, S., 1931, <i>Amer. J. Path.</i> , 7 , 161	Chondrosarcoma of sacro-iliac joint	No operation save biopsy 44 months earlier. Death 8 days after first symptom of pulmonary embolism
Pettersson, G., 1941, <i>Acta chir. scand.</i> , 84 , 321	Kidney	During operation
Gordon-Taylor, G., and Wyndham, N. R., 1947, <i>Brit. J. Surg.</i> , 35 , 6	Testicle	Sudden death. No operation
Mimpriss, T. W., and Birt, St. J. M. C., 1949, <i>Brit. J. Surg.</i> , 36 , 429	Kidney	During operation
McLaren Todd, R., 1951, <i>Brit. J. Surg.</i> , 39 , 447	Adrenal cortex	Ten minutes after operation
Willis, R. A., 1952, <i>The Spread of Tumours in the Human Body</i> , 2nd ed., Butterworth, London	Round-cell sarcoma of thigh	No operation. Sudden death in an attack of acute dyspnoea
" "	Leiomyosarcoma of uterus	Sudden death a few weeks after hysterectomy
Masson, A. H. B., and Branwood, A. W., 1955, <i>British Medical Journal</i> , 1 , 1514	Kidney	During operation
Yates, H. B., 1955, <i>British Medical Journal</i> , 2 , 202	"	" "

TABLE II.—*Reports of Deaths Due to Systemic Neoplastic Embolism*

Author	Site of Primary Growth	Relation of Death to Operation	Site of Embolus
Thompson, T., and Evans, W., 1929, <i>Quart. J. Med.</i> , 23 , 135	Bilateral testicular teratomata	No operation. Death 5 days after onset of hemiplegia	Both coronary arteries, Right middle cerebral artery. Paradoxical embolism via patent foramen ovale
Eason, E. H., 1950, <i>J. Path. Bact.</i> , 62 , 454	Carcinoma of bronchus	48 hours after pneumonectomy	Right middle cerebral artery
Aylwin, J. A., 1951, <i>Thorax</i> , 6 , 250	Fibrosarcoma of back	5 hours after pneumonectomy for solitary metastasis, right lung	Aortic, bifurcation and coeliac artery
" "	Carcinoma of bronchus	10 hours after pneumonectomy	Right middle cerebral artery and right axillary artery
Loosemore, T. G. E., and Whittick, J. W., 1951, <i>J. Path. Bact.</i> , 63 , 133	Malignant synovioma of knee	Death 24 hours after embolectomy. No operation for large pulmonary metastasis	Left axillary artery
Miller, A. A., and Jackson, F. B., 1954, <i>J. Path. Bact.</i> , 68 , 221	Myxosarcoma, left lung	No operation. Death 3 weeks after onset of hemiplegia	Right cerebral hemisphere

Aylwin (1951) stressed the fact that malignant tissue may be released into the circulation during resection of bronchial carcinoma, and urged early proximal ligation of the pulmonary veins to lessen this risk. In the case reported here a large intra-atrial projection of growth must have been present before operation. Ligation of the pulmonary veins close to the left atrium or resection of a small portion of atrial wall could not have prevented dislodgment of the intracardiac tumour extension. Inoperability could have been demonstrated only by the use of the best techniques of angiocardiology. An unusual feature was that pure tumour emboli were of sufficient size to cause death by obstructing the outflow from the left side of the heart.

I thank Mr. Dillwyn Thomas for permission to publish the case, and Dr. R. M. E. Seal for the pathological examinations. This case was mentioned briefly in a letter to the *British Medical Journal* (1955, **2**, 263), Tables I and II from which have been here amplified.

REFERENCE

Aylwin, J. A. (1951). *Thorax*, **6**, 250.

CYSTIC DISEASE OF THE LUNGS

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Since 1949, when nationalization brought increased diagnostic facilities, augmented in 1951 by the use of miniature mass radiography, a relatively high incidence of cystic disease of the lungs has been observed in this area. That the condition, although uncommon, is of significance will be seen from the degree of disability experienced in the cases here reviewed. Relatively little seems to be known about the cause, and although many cases have been reported, the mechanism of formation of persisting lung cysts is certainly still to be defined.

In a population of 132,000, 23 cases have been found, and 17 of these have been examined for the purposes of this survey.

History

The first case of cystic lung disease was described by Fontanus over three hundred years ago in a baby of 3 months (Bowden, 1948). Bartholinus recorded a case in 1687 (Levine, 1950). Levine also states that Koontz in 1925 collected 108 cases from European literature, less than 100 being true cases of cystic lung disease, and that Scherck in 1937 collected 381 cases—Wood adding 48 more seen at the Mayo Clinic. Liese recorded 400 in the same period. Liese's cases included some of those recorded by Schenck; the total number of cases was therefore about 600.

Levine thought that large cysts were the result of an early arrest in development, while extensive areas of multiloculated or uniloculated cysts pointed to a later arrest. Most investigators consider that the true congenital cyst is lined by a bronchial type of epithelium and that the presence of alveolar cells in the cyst wall indicates a non-congenital origin. Potts and Riker (1950) described a number of cases of cysts of the latter type following staphylococcal pneumonia, and state that these may resolve. On the other hand, Cooke and Blades (1952) divide congenital cysts into three main groups: bronchogenic cell type, solitary or multiple; alveolar cell type, solitary or multiple; and combined bronchogenic and alveolar types.

A number of reported cases have required pneumonectomy during the first few weeks of life. These cysts are