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Endobronchial Carcinosarcoma

A Case with Osteosarcoma of Pulmonary Invasive Part, and a Review with Respect to Prognosis

Erik Ludwigsen
Institute of Pathology, Vejle Hospital, Vejle, Denmark

Summary. A case of endobronchial carcinosarcoma is reported in which a small area of epidermoid carcinoma at the base of the partly necrotic, polypoid part of the tumor was found, and where the pulmonary invasive part consisted of osteosarcoma. To our knowledge such a case has not been published before.

In the literature 23 cases of endobronchial carcinosarcoma were found. All but one of those alive at the time of diagnosis were considered operable. The first year survival rate of the reviewed and the reported cases was 36% of all or 42% of the resected cases. The figures for bronchial carcinoma are 33% or 62% of the resected cases. The pre- and post-operative mortality for endobronchial carcinosarcoma was 23%. Because follow-up was too short, the 5 year survival rate cannot be estimated. Features common to pulmonary sarcoma and pseudosarcoma of the upper respiratory tract are also discussed.

Key words: Carcinosarcoma – Endobronchial – Osteosarcoma – Prognosis.

Introduction

Since Kika published the first case of pulmonary carcinosarcoma in 1908, about 40 cases have been reported. The degree of recognition of carcinosarcoma as a distinct pathologic entity has varied somewhat during these past 70 years. In 1938 Saphir and Vass reviewed the published cases of carcinosarcoma and, mostly on the basis of photomicrographs, considered the sarcomatous component to be either anaplastic carcinoma or stromal cells altered by inflammation in most instances. Only one dubious case of carcinosarcoma remained. No further descriptions appeared for about 10 years. Bergmann et al. (1951) re-

Requests for offprints should be addressed to: Dr. Erik Ludwigsen, University Institute of Pathology, Odense Hospital, DK-5000 Odense, Denmark

viewed earlier cases and added 2, and finally established this tumor entity. Barrett and Barnard (1945) described a special type of carcinosarcoma with epithelial tubules in a foetal pulmonary stroma, which was later named by Spencer (1961) as pulmonary blastoma. Drury and Stirland (1959) were probably the first to separate the pulmonary carcinosarcomas into endobronchial and peripheral types.

In most published cases of endobronchial and peripheral carcinosarcomas the carcinomatous component has been squamous-cell or epidermoid, and in all cases the sarcomatous component has contained an element of fibro- or spindle-cell sarcoma. In addition elements of osteoid, chondro- and osteosarcoma and rhabdomyoblast-like cells have been described (Drury and Stirland, 1959; Moore, 1961; Prive et al., 1961). In the case reported here most of the tumor presented as an osteosarcoma, which to our knowledge has not been described before.

We have reviewed the literature of endobronchial carcinosarcoma to see if any conclusions can be drawn with respect to prognosis. The data has been compared with those of bronchial carcinoma.

We also wish to call attention to the risk of bleeding from this type of tumor following biopsy. Apart from our own case, Taylor and Rae (1952) have described bleeding complicating biopsy and contributing to a fatal outcome.

Case Report

A 76-year old man, a former carpenter, was admitted to hospital because an X-ray of the chest had shown massive atelectasis of the left lung. He had never been hospitalised, but for several years he had had slight chronic bronchitis, arteriosclerotic heart disease and peptic ulcer.

Bronchoscopy revealed a polypoid grey-red tumor totally occluding the left main bronchus and protruding almost to the carina. Biopsy showed totally necrotic tissue. Mediastinal lymph nodes removed at the same time showed antracosis. During a further bronchoscopy several biopsies were taken and severe hemorrhage occurred. During attempts at hemostasis the patient succumbed to intractable cardiac arrest. The biopsies revealed necrotic tissue and malignant mesodermal tumor, presumably fibrosarcoma. Previously, examination of 3 sputa and 1 bronchial lavage specimens had shown no malignant cells.

At autopsy the left main bronchus was totally occluded by a 4 cm long polypoid tumor originating in the upper lobe bronchus and protruding into the lower lobe bronchus (Fig. 1).

The surface of the polyp was necrotic and the adjoining bronchial mucosa looked normal. The left upper lobe contained a solid, grey-white, hard, lobulated tumor, which was gritty on cutting, due to multiple chalk-like foci. Outside the main tumor several tumor nodules up to 3 cm in size were found, so that only a 2 cm wide band of atelectatic lung tissue was left peripheral to the tumor (Fig. 2). The lower lobe contained massive confluent bronchopneumonia but no metastases. The right lung was normal except for hypostatic oedema. Proximal to the tumor the bronchial system was filled with blood. The pulmonary vessels were compressed by tumor but showed no invasion. The mediastinal lymph nodes were enlarged but contained no metastases, and no metastases were found in other organs. The heart showed moderate dilatation with slight left-sided hypertrophy. The coronary arteries showed severe non-

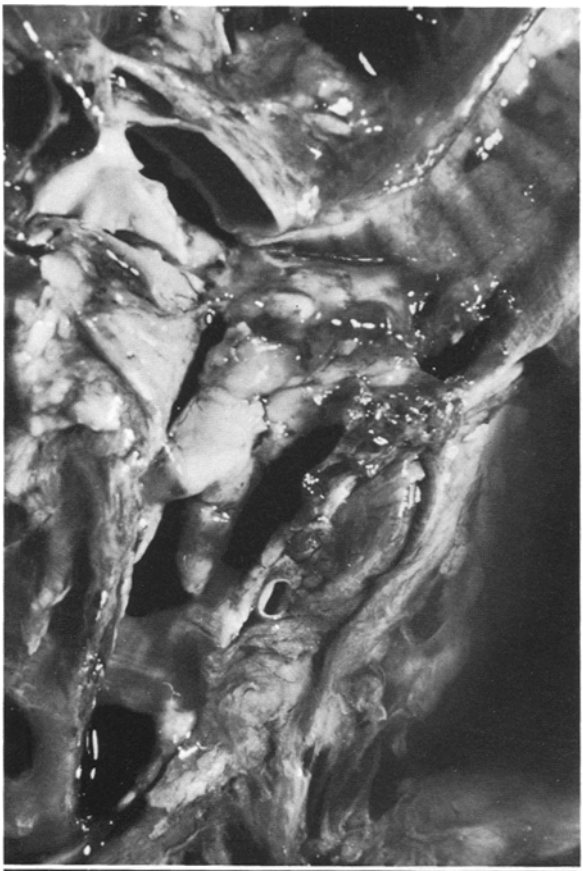

Fig. 1. Showing the endobronchial polyp originating from the left upper lobe bronchus

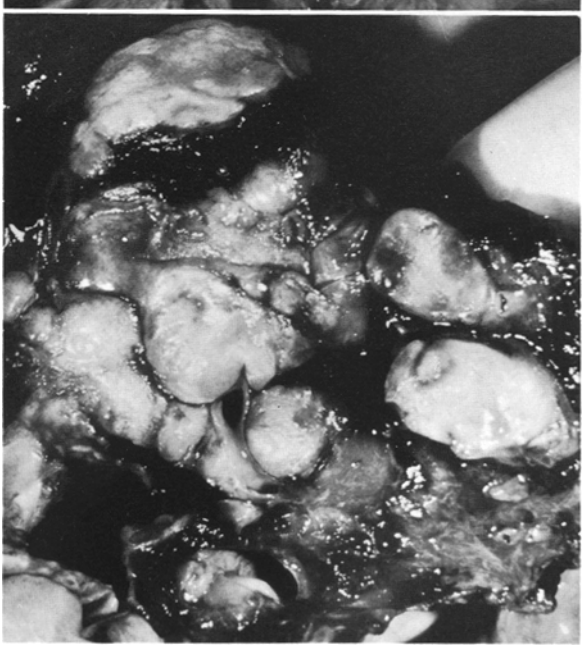

Fig. 2. Showing the parenchymatous lobulated part of the tumor

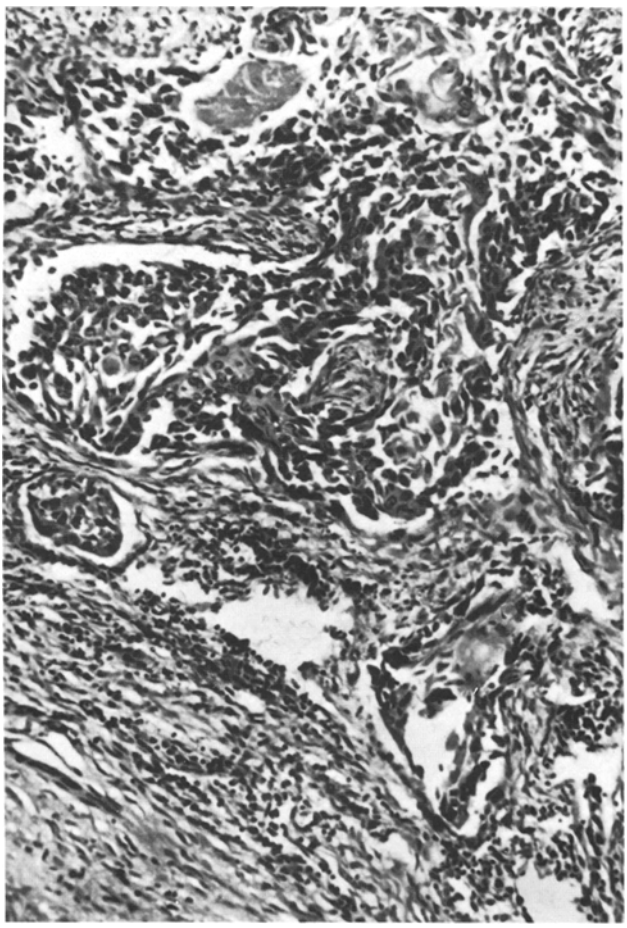

Fig. 3. Infiltrating epidermoid carcinoma at the base of the polyp (H & E, ×160)

stenosing atherosclerosis. There was also a simple nodular goiter, benign prostatic enlargement and an acute duodenal ulcer.

Multiple sections of the polypoid tumor with adjoining mucosa and of the peripheral part of tumor were taken for microscopy. The sections were stained with hematoxylin and eosin, Van Gieson-Hansen, periodic-acid-Schiff, Gordon and Sweet's method for reticulin, and with phosphotungstic acid hematoxylin.

The surface of the polypoid tumor showed extensive total necrosis, but islands of epidermoid carcinoma were recognisable. At the base of the polyp a small area of superficially infiltrating epidermoid carcinoma was found (Fig. 3), which to some extent intermingled with the underlying sarcomatous part of the tumor. The stroma of the polyp presented a cellular fibrosarcomatous appearance and contained occasional tumor giant-cells in the collagen rich matrix. The reticulin stain showed a fine fibrillar structure. At the base of the tumor some osteoclast-like cells were found. That part of the tumor which invaded

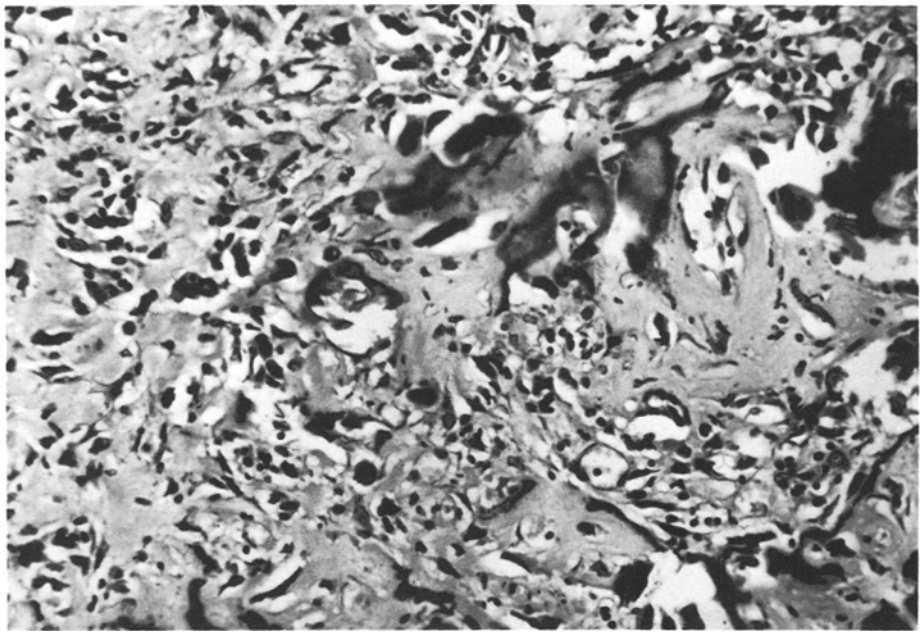

Fig. 4. From osteosarcomatous parenchymatous part of tumor with osteoid and calcification and with malignant osteoblasts (H & E, ×250)

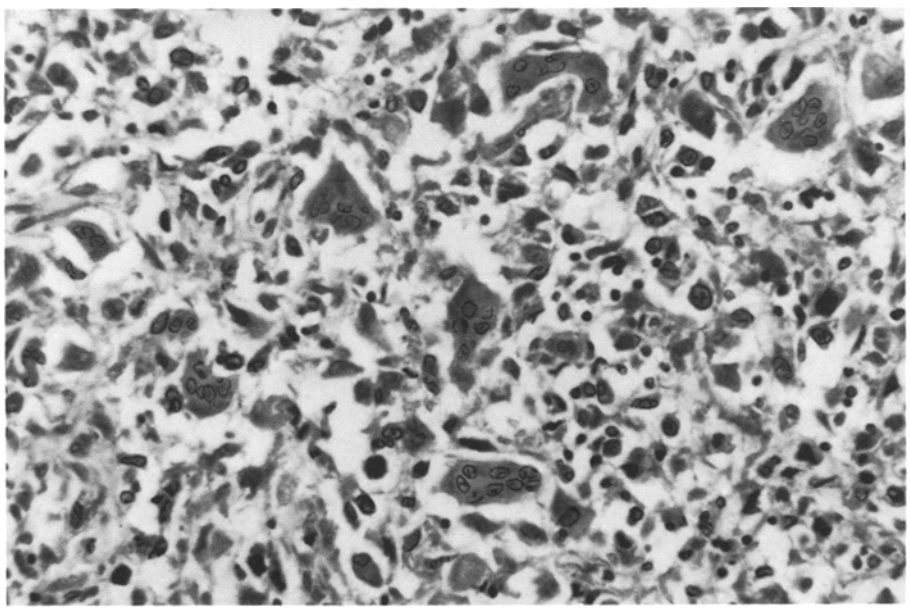

Fig. 5. Part of tumor containing osteoclasts (H & E, ×250)

the lung parenchyma presented as a mainly cellular and polymorphic osteosarcoma, showing several mitoses. Osteoid was found in multiple foci often with calcification, and at the borders of the osteoid and in the lacunae malignant osteoblast-like cells were seen (Fig. 4). Other areas were dominated by osteoclast-like cells (Fig. 5). Strap-like cells were present, but no cross striation could be demonstrated. There was little necrosis in the body of the tumor, which was mostly demarcated by a collagenous pseudocapsule from the surrounding lung parenchyma. In some areas however, there was infiltration of the lung as well as vascular invasion. No areas resembling pulmonary blastoma were seen.

Discussion

Pulmonary carcinosarcoma, pure endobronchial or with an endobronchial component, was found in 23 cases besides our own (Table 1). The male:female ratio is apparently 11:1. The age of the patients was 46-74 years with a mean of 63 years. The three cases reported by Davis et al. were classified as transitional forms between carcinosarcoma and blastoma.

Sixteen tumors were located in an upper lobe bronchus. In males the tumor was purely or partly epidermoid whilst in the two females reported the tumor contained adenocarcinoma. The sarcomatous component in all cases was a spindle-celled sarcoma but in some contained a more differentiated form of sarcoma.

Fourteen patients were treated by pneumonectomy, 5 by lobectomy and 1 patient, considered inoperable when diagnosed, was treated with radiation. Four patients had no treatment at all, in 2 the tumor being an unexpected finding and 2 dying of complications related to biopsy.

Of the 24 cases 9 had pure endobronchial tumors. One had carcinomatous hilar lymph node metastasis at operation and died suddenly 9 months postoperatively, 3 died a few days postoperatively, and 2 were alive 3 months and 3 years postoperatively without evidence of recurrence.

Of the 13 patients with pulmonary invasion, 6 had regional lymph node metastasis at operation, and of these 2 died 3 and 11 months postoperatively with widespread local recurrence and metastasis. One patient died $4^1/_2$ months later with hilar lymph node metastasis, and another died after 6 months without clinical evidence of recurrence. Two patients are alive after 6 and 18 months without recurrence.

Of the 7 patients with pulmonary invasion but without metastasis at operation 3 died 9, 18 and 21 months postoperatively. Of these 1 had a local recurrence and liver and bone metastases, while a further 2 had bone metastases. Four patients are alive 15, 18, 19 months and 6 years postoperatively without recurrence.

Certain facts support the contention that endobronchial carcinosarcomata are a special group of tumors. The tumors have a characteristic macrosopic appearance presenting purely or partly as bronchial polyps, an appearance only occasionally seen in bronchial carcinoma (Melamed, 1968). Bronchial carcinoma

is probably the most important differential diagnosis, especially in those cases where the sarcomatous component is a fibrosarcoma dominated by spindle cells, and where the alternative diagnosis is a poorly differentiated carcinoma. A reticulin stain may help in such cases (Spencer, 1968).

Most cases of endobronchial carcinosarcoma, when first discovered, are operable. In the cases reviewed 1 patient had undergone inadequate radical surgery and 1 of the cases was inoperable (Stackhouse, 1969). This contrasts with only 45–47% of epidermoid bronchial carcinomas being operable when diagnosed (Schottenfeld, 1968).

Of the 19 patients operated upon only 1 survived more than 5 years (Bergmann, 1951), 4 patients survived $1^1/_2$ years or more and 3 patients was alive with a follow-up less than $1^1/_2$ years without clinical recurrence. Seven patients (29%) had metastases at operation or at autopsy. Six patients (32%) developed metastases and/or local recurrence postoperatively, most of them within 6 months but all had pulmonary invasion and/or lymph node metastasis at the time of operation. In the group of cases with pure endobronchial tumors, those expected to show the best prognosis, half of the treated patients died very shortly after operation, and only one has survived 3 years. The character of the sarcomatous component does not seem to influence the prognosis. In 6 cases the postoperative metastases were histologically classified; 3 had both carcinomatous and sarcomatous metastases, and 3 had either carcinomatous or sarcomatous metastases (Stackhouse, 1969; Chaudhuri, 1971).

Seven patients (37%) with a surgically removed endobronchial carcinosarcoma had metastases and Nohl (1956) found that approximately the same number (34%) of surgically treated squamous-cell bronchial carcinomas had metastasized. The first year survival rate for the reviewed cases of endobronchial carcinosarcoma was 36% of all patients and 42% of the resected cases. Included among the latter are 3 patients observed for less than a year, 1 of which developed metastases after 3 months. The comparative figures for bronchial carcinoma are 33% and 62% respectively (Bignall et al., 1967). In the whole series of carcinosarcomas, 5 patients died either from the complications of a biopsy or in the early postoperative period (23%), and only 1 patient was alive at 5 years.

The polypoid nature of the endobronchial carcinosarcoma makes comparison with pulmonary sarcomas reasonable. The latter are also divided into an endobronchial, mostly polypoid type, and a parenchymatous type (Spencer, 1968). The polypoid type often shows ulceration and necrosis of the surface like endobronchial carcinosarcomas. Often the carcinomatous element in a carcinosarcoma forms only a small part of the tumor, making it easy to mistake the tumor for a sarcoma unless multiple sections are taken. It is likely therefore that some tumors classified as sarcomas may have been carcinosarcomas.

The small areas of carcinoma compared with the more extensive areas of sarcoma are similar to those seen in the pseudosarcoma of the upper respiratory tract (Lane, 1957). The latter tumor has a morphology much like endobronchial carcinosarcoma, and the sarcoma-like stroma may also contain chondroid and osteoid tissue (Appelman et al., 1965). The upper respiratory tumors also pursue a more favorable course, but may recur locally or metastasize (Hughes

Table 1. Own case and hitherto published cases of purely or partly endobronchial carcinosarcoma

Author and year	Sex, age	Size cm	Lung invasion	Localization	Treatment
Bergmann et al. (1951)					
case 1	♂, 51	4	+	r.u.l.	pneumonectomy
case 2	♂, 56	3	+	r.u.l.	pneumonectomy
Taylor and Rae (1952)					
case 1	♂, 69	$4 \times 1^1/_2 \times 1$	÷	r.m.br.	pneumonectomy
case 2	♂, 57	2×1	÷	r.m.br.	÷
Drury and Stirland (1959)					
case 1	♂, 69	$3^1/_2 \times 2 \times 1$	÷	tracheal	÷
case 2	♂, 71	1	÷	r.u.l.	÷
Moore (1961)	♂, 64	3	+	r.l.l.	lobectomy
Prive et al. (1961)	♂, 46	2	+	l.u.l.	pneumonectomy
Stackhouse et al. (1969)					
case 2	♂, 54	?	+	r.u.l. + m.br.	biopsy + radiation
case 3	♂, 74	$6 \times 5 \times 5$	+	r.u.l.	pneumonectomy
case 4	♀, 60	$6 \times 5 \times 5$	+	r.u.l.	lobectomy + radiation
case 5	♂, 68	$3 \times 2^1/_2 \times 3$	÷	l.u.l.	pneumonectomy
Chaudhuri (1971)					
case 1	♂, 65	$10 \times 10 \times 6$	+	l.l.l.	pneumonectomy
case 2	♂, 69	1×1	÷	l.u.l.	lobectomy
Kakos et al. (1971)	♂, 72	?	+	l.l.l.	pneumonectomy
Razzuk et al. (1971)					
case 1	♂, 61	?	+	l.u.l.	pneumonectomy
Weaver et al. (1971)	♂, 67	4	+	r.u.l.	lobectomy
Davis et al. (1972)					
case 5[a]	♂, 58	$5 \times 2 \times 2$	+	r.u.l.	lobectomy
case 6[a]	♂, 65	3	÷	r.u.l.	pneumoncetomy
case 7[a]	♀, 61	$2^1/_2 \times 1 \times 1$	÷	l.m.br.	pneumoncetomy
case 9	♂, 66	3×2	÷	r.u.l.	pneumonectomy
Kaik et al. (1973)	♂, 62	?	+	l.u.l.	pneumonectomy
Bull et al. (1973)	♂, 56	?	+	l.l.l.	pneumonectomy
Own case	♂, 71	$9 \times 8 \times 6$	+	l.u.l.	÷

[a] Transitional between blastoma and carcinosarcoma

r.u.l. = right upper lobe; r.l.l. = right lower lobe; l.u.l. = left upper lobe; l.l.l. = left lower lobe; r.m.br. = right main bronchus

Metastasis at operation	Histological type	Postoperative history
÷	epidermoid + spindle-cell	alive 6 years
÷	epidermoid + spindle-cell	alive $1^1/_2$ years
÷	epidermoid + fibrosarcoma	alive 3 years
÷	epidermoid + fibrosarcoma	died of bronchial bleeding 72 h after operation
÷	epidermoid + fibrosarcoma	occasional finding at autopsy
÷	epidermoid + fibrosarcoma	occasional finding at autopsy
÷	epidermoid + fibrosarcoma + osteoid + rhabdomyoblasts	alive 19 months
+	epidermoid + chondrofibrosarcoma	alive 18 months
÷	squamous-cell + fibrosarcoma	costal + pelvic metastases at 3 months, thereafter no follow-up
+	squamous-cell + fibrosarcoma + focal osteoid	died of myocardial infarction after 6 months without clinical recurrence
+	adeno + undifferentiated largecell + fibrosarcoma	died after 11 months with osseous, pulmonary and mediastinal metastases
÷	epidermoid + fibrosarcoma	died after 6 days of respiratory insufficiency
+	epidermoid + fibrosarcoma	died after 3 months with widespread local recurrence
÷	epidermoid + spindle-cell	died after 2 days of pulmonary embolism
+	?	alive after 6 months
÷	epidermoid + spindle-cell	died after 21 months, after $^1/_2$ year evidence of osseous metastasis not histologically verified
÷	carcinoma + leiomyosarcoma	alive after 15 months
÷	epidermoid + tubular + spindle-cell + blastoma	died after 18 months with liver and osseous metastases, local recurrence after 1 year, no autopsy
÷	epidermoid + cubic + spindle-cell + blastoma	died shortly after operation, autopsy?
÷	epidermoid + adeno + spindle-cell + blastoma	alive after 3 months
+	epidermoid + spindle-cell	died suddenly after 9 months, no autopsy
÷	epidermoid + spindle-cell	died after 9 months with evidence of osteoclastic metastasis after 7 months
+	epidermoid + spindle-cell	died after $4^1/_2$ months of myocardial infarction with hilus lymphnode metastasis at autopsy
+	epidermoid + fibrosarcoma + widespread osteosarcoma	died in consequence of bronchial bleeding after biopsy of arteriosclerotic heart disease

et al., 1969). In endobronchial carcinosarcoma both carcinomatous and sarcomatous metastases can occur in the same patient (Stackhouse, 1969) and the same was reported by Minckler et al. (1970) in carcinosarcomas of the upper respiratory tract.

References

Appelman, H.D., Oberman, H.A.: Squamous cell carcinoma of the larynx with a sarcoma-like stroma. Amer. J. clin. Path. **44**, 135–145 (1965)

Barrett, N.R., Barnard, W.G.: Some unusual thoracic tumours. Brit. J. Surg. **32**, 447–457 (1945)

Bergmann, M., Ackerman, L.V., Kemler, R.L.: Carcinosarcoma of the lung. Cancer (Philad.) **4**, 919–929 (1951)

Bignall, J.R., Martin, M., Smithers, D.W.: Survival in 6086 cases of bronchial carcinoma. Lancet **1967 I**, 1067–1070

Bull, J.C., Grimes, O.F.: Pulmonary carcinosarcoma. Chest **65**, 9–12 (1974)

Chaudhuri, M.R.: Bronchial carcinosarcoma. J. thorac. cardiovasc. Surg. **61**, 319–323 (1971)

Davis, P.W., Briggs, J.C., Seal, R.M.E., Storring, F.K.: Benign and malignant mixed tumours of the lung. Thorax **27**, 657–673 (1972)

Drury, R.A.B., Stirland, R.M.: Carcino-sarcomatous tumours of the respiratory tract. J. Path. Bact. **77**, 543–554 (1959)

Hughes, J.H., Cruickshank, A.H.: Pseudosarcoma of the oesophagus. Brit. J. Surg. **56**, 72–76 (1969)

Kaik, G., Harazim, H., Kaik, B.: Über Karzinosarkome der Lunge. Prax. Pneumol. **27**, 604–616 (1973)

Kakos, G.S., Williams, T.E., Assor, D., Vasko, J.S.: Pulmonary carcinosarcoma. J. thorac. cardiovasc. Surg. **61**, 777–783 (1971)

Kika, cited by Herxheimer, G., Reinke, F.: Pathologie des Krebses. Ergebn. allg. Path. path. Anat. **16**, 280–282 (1912)

Lane, N.: Pseudosarcoma (polypoid sarcoma-like masses) associated with squamous-cell carcinoma of the mouth, fauces and larynx. Cancer (Philad.) **10**, 19–41 (1957)

Melamed, M.R.: Pathology. In: Lung cancer, pp. 35–138, edit. by Watson, W.L. Saint Louis: Mosby 1968

Minckler, D.S., Meligre, C.H., Norris, N.T.: Carcinosarcoma of the larynx. Cancer (Philad.) **26**, 195–200 (1970)

Moore, T.C.: Carcinosarcoma of the lung. Surgery **50**, 886–893 (1961)

Nohl, H.C.: Thorax **11**, 172 (1956), cited by Spencer, H.: Pathology of the lung, II ed., p. 852. Oxford-New York-Toronto-Sydney-Braunschweig: Pergamon Press 1968

Prive, L., Tellem, M., Meranze, D.R., Chodooff, R.D.: Carcinosarcoma of the lung. Arch. Path. **72**, 351–357 (1961)

Razzuk, M.A., Urschel, H.C., Race, G.J., Arndt, J.H., Paulson, D.L.: Carcinosarcoma of the lung. J. thorac. cardiovasc. Surg. **61**, 541–546 (1971)

Saphir, O., Vass, A.: Carcinosarcoma. Amer. J. Cancer **33**, 331–361 (1938)

Schottenfeld, D.: Factors bearing on prognosis: a review of 3124 cases. In: Lung cancer, pp. 518–528, edit. by Watson, W.L. Saint Louis: Mosby 1968

Spencer, H.: Pulmonary blastomas. J. Path. Bact. **82**, 161–165 (1961)

Spencer, H.: Pathology of the lung, II ed., pp. 908–910. Oxford-New York-Toronto-Sydney-Braunschweig: Pergamon Press 1968

Stackhouse, E.M., Harrison, E.G., Ellis, F.H.: Primary mixed malignancies of the lung: Carcinosarcoma and blastoma. J. thorac. cardiovasc. Surg. **57**, 385–399 (1969)

Taylor, H.E., Rae, M.V.: Endobronchial carcinosarcoma. J. thorac. Surg. **24**, 93–100 (1952)

Weaver, P.C., Branfoot, A.C., Hargrove, R.L.: An endobronchial carcinosarcoma treated by lobectomy. J. thorac. cardiovasc. Surg. **61**, 300–303 (1971)

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