previously acknowledged. For primary pulmonary sarcoma, 7 of 8 patients who were treated with induction chemotherapy had at least a partial response to chemotherapy, including one complete response, surprisingly. Very few patients with pulmonary carcinosarcoma were treated with induction therapy in this cohort, but patients with more advanced disease were treated with chemotherapy, radiotherapy, and/or immunotherapy if positive for PDL-1 expression, with remarkably similar survival as surgical patients as noted previously. This finding does not undermine the role of surgery but rather enhances the argument for multimodality treatment in my view. Given these results and a high rate of R1 resection, induction therapy should be considered more often.

In conclusion, the 3 main take-home messages of this study are that (1) surgery is the mainstay of treatment, (2) invasive mediastinal staging should be strongly considered in pulmonary carcinosarcomas, and (3) multimodality therapy including possibly immunotherapy may have an enhanced role in both histologies. The level of evidence is low, but any prospective study examining these rare tumors will be challenging.

References

Commentary: Primary pulmonary sarcomas and pulmonary carcinosarcomas, challenging and enigmatic, but treatable!

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Primary pulmonary sarcomas (PPS) and pulmonary carcinosarcomas (PCS) are rare, sarcomatous subtypes of lung cancer. They display more aggressive features than the more common non–small cell lung cancers (NSCLC). According to the World Health Organization classification of tumors, sarcomatoid carcinomas account for 0.1% to 0.4% of all lung cancers. Furthermore, only 4% of this subgroup are PCS.1 Similarly, PPS accounts for <0.5% of all lung cancers.2 Clinical and imaging features of PPS and PCS are similar to other subtypes of NSCLC. However, they often present with locoregional invasion and distant metastases. Due to their more aggressive behavior, both PPS and PCS have a relatively poor prognosis compared...
with other NSCLC subtypes, and specific treatment algorithms have not been well established.\(^1,2\)

In the present study, 100 patients (45 PPS and 55 PCS) who were treated at a single center between 1998 and 2019 were retrospectively analyzed.\(^3\) Median survival times and 5-year survival rates of resected and non-resected PPS were 39.6 months and 28.7\%, and 4.9 months and 7.8\%, respectively. For resected and non-resected PCS, median survival times and 5-year survival rates were 23.6 months and 31.0\%, and 14.9 months and 28.2\%, respectively. On multivariable analysis, age, smoking history, histology, and surgery were independent risk factors for survival. Surgical treatment was performed in 69\% and 53\% of all patients with PPS and PCS, respectively, with low overall surgical mortality rates (3\% for PPS and 0\% for PCS). These outcome data are encouraging and suggest that complete surgical resection may yield long-term survival rates. However, these results are based on retrospective data derived from a period of more than 20 years, during which diagnostic and therapeutic approaches may have significantly changed and improved. Furthermore, only a minor difference was found in 5-year survival rates between surgically resected and non-resected PCS. Therefore, the precise role of surgery in the latter subgroup is debatable and should likely be viewed in a multimodality setting.

As the majority of the patients in this study presented with locally advanced, non–stage I tumors, multimodality treatment is indicated to improve the outcome.\(^3\) Although no strict guidelines can be put forward, a combination of chemotherapy, radiotherapy, surgery, and/or immunotherapy should be considered for patients with locoregionally advanced disease. Multidisciplinary discussion and extensive diagnostic workup are necessary to decide on the best treatment regimen for each patient. More data are necessary to investigate the role of positron emission tomography scanning, invasive staging, systematic nodal dissection, and induction or adjuvant therapy.

Due to the rarity of these tumors, it will be nearly impossible to perform prospective, randomized studies with a control arm. However, every center dealing with these rare tumors, is encouraged to participate in the prospective database of IASLC (International Association for the Study of Lung Cancer) to shed more light on their behavior and response to combined modality therapy.\(^4\) Hopefully, by providing a thought-provoking insight into PPS and PCS, the present paper may raise the awareness of these still enigmatic malignancies.

References