Role of computed tomography in the preoperative diagnosis of giant benign solitary fibrous tumor pleura

Sir,

We read with interest the article entitled "Giant solitary fibrous tumor: Clinical dilemma and diagnosis" published in the April-June issue of Lung India.[1] Solitary fibrous tumor pleura (SFTP) is a localized, well-circumscribed, mesenchymal tumor of uncertain cell origin. Though the majority of these tumors are benign, about 22-36% can be malignant.[2,3] The majority of benign SFTPs are cured with local resection. Even patient with massive benign lesions may do well with re-expansion of the compressed lung after surgery. The average size of benign and malignant SFTP is 13.2 cm and 14.4 cm, respectively.[3] Sixty-two percent of SFTPs are >10 cm.[2] Sometimes SFTP grow to a diameter of 30-40 cm. Numerous reports described "giant" benign SFTP but the precise size has not been established in the definition of "giant" lesions. We believed that benign SFTPs may be defined "giant" when the lesions have a diameter >15 cm and benignancy criteria have been established with accuracy. The mitotic-figure-per-10-high-power fields (HPFs) index was determined by counting two to five sets of 10 consecutive HPFs (×400) in most cellular tumors and then proceeding randomly. Benign SFTPs may fill the hemithorax, compress the adjacent lung and produce symptoms, but they are slow growing and do not invade adjacent tissues. We recently observed a 61-year-old female who was referred to our hospital with cough and dyspnea. Computed tomography (CT) showed a large mass, with well-defined borders, occupying the left hemithorax with partial saving apex of ipsilateral lung displacing the mediastinum to the right. A thoracotomy with complete surgical resection of the tumor was performed. Histologically the tumor showed a "patternless" architecture characterized by the coexistence of hypo- and hypercellular areas separated by fibrous stroma having "hemangiopericytoma-like" branching blood vessels. The lesion appeared as a sharply circumscribed mass pushing, but not invading, the borders with the adjacent lung parenchyma. Mitotic figures were <4 per 10 HPFs, necrosis and hemorrhage was not evident, and pleomorphic, hyperchromatic, or anaplastic nuclei were absent. The diagnosis of "benign SFTP" was performed. The neoplastic spindle cells were immunopositive for CD34 and vimentin, and immunonegative for cytokeratins, smooth muscle actin, desmin, muscle-specific actin, S-100 protein, CD31, and factor VIII. This staining pattern assists in differentiating SFTPs from other spindle cell neoplasms of the pleura including diffuse malignant mesothelioma. SFTP was probably first mentioned by Wagner in 1870, but pathologic description did not appear until 1931 (Klemperer and Rabin).[4] The first large collected review series of SFTPs describing the clinicopathologic features appeared subsequently in 1981, reported by Briselli *et al*.[5] (368 cases), in 1989 by England *et al*.[2] (223 cases), and in 2003 by Rosado-de-Christenson[3] (82 cases). The usual initial diagnostic test for SFTP is a chest radiograph, which is not specific but serves to document the presence of a mass in the chest. The chest CT scan is the key examination, which more clearly shows the size and location of tumor and aids in surgical planning. The CT morphologic features of 78 localized fibrous tumors of the pleura (61 benign and 17 malignant) have been examined by Rosado-de-Christenson *et al*.[3] These authors concluded that small tumors without gloss necrosis, hemorrhage, or cystic change may exhibit homogeneous alteration on unenhanced and less frequently on contrast-enhanced chest CT scans. The majority of SFTPs exhibit heterogeneous attenuation on CT scans characterized as intraregional geographic, focal or linear areas of low attenuation that often correlate with hemorrhage, necrosis, or cystic changes. Calcifications may occur in one-fourth of cases. Atelectasis of the adjacent lung and mass effect on the mediastinum are common associated findings. Briselli *et al*.'s study[5] examined 360 cases of SFTPs

Table 1: Clinical, radiological findings, size, site, treatment, percutaneous, core biopsy and follow-up, giant benign solitary fibrous tumour of the pleura (>15 cm): review of the literature

Authors	Age/ sex	Anatomic site	Symptoms	Size/weight	Radiological findings	Percutaneous needle biopsy	Treatment	Follow-up
Briselli *et al.* (1980)[5]	29/F	Left parietal pleura chest wall	Chest pain	20 cm MD/NS	NS	NS	NS	NS
	47/M	Right parietal pleura chest wall	None	33 cm MD/NS	NS	NS	NS	NS
Khan *et al.* (1998)[7]	44/M	Left hemithorax, anterior mediastinum, with extension into the right site of left chest	Progressively increasing shortness of breath	26×24×12 cm/NS	Chest X-ray; CT scan: Large, heterogeneous mass in the left chest displacing the mediastinal structures to the right, involving the lung parenchyma and hilum with some central calcifications	NS	CTR	Free of recurrence 9 months after resection
De Perrot *et al.* (1999)[8]	NS	NS	NS	20 cm MD/NS	CT scan: Large solitary fibrous tumor of the pleura with heterogeneous zones due to hemorrhage and necrosis of the tumor. There is no evidence of chest wall invasion	NS	NS	No recurrence after 54 months of follow up
	NS	NS	NS	15 cm MD	NS	NS	NS	No recurrence after 4 months of follow up
Kumar *et al.* (2003)[9]	53/F	Left pleural cavity	Shortness of breath and left sided chest pain of 6 months duration	25×15 cm/2500 g	Chest X-ray: A homogeneous well defined opacity with convex superior border in the mid and lower zone of left hemithorax with obliteration of the cardio-phrenic and costophrenic angles. There is shift of mediastinum to the right CT: Scan a large soft tissue density mass in the left pleural cavity with compression of the left lower lobe and lingularsegments of the lung	Mature collagen tissue	CTR	Asymptomatic, without any evidence of recurrence, 2 years following surgery
Chong *et al.* (2006)[10]	63/M	Lower hemithorax right/fissural space	NS	16.4×15.8 cm/NS	Contrast CT: Heterogeneous contrast enhancement (central low-attenuation areas of mass surrounded by areas of homogeneous enhancement)	NS	NS	NS
	63/M	Costal pleural space	NS	17.6×13.4 cm/NS	Contrast CT: Heterogeneous contrast enhancement (central low-attenuation areas of mass surrounded by areas of homogeneous enhancement)	NS	NS	NS
Bar *et al.* (2007)[11]	67/NS	Left pleural cavity	Dyspnea	18×19 cm/950 g	CT: Large left intrapleural mass	NS	P	Alive
Mune *et al.* (2010)[12]	53/M	Left pleural cavity	Left sided chest pain, cough, and weight loss of 5 years duration	25×19×10.5 cm/NS	Chest X-ray: Mass in the left hemithorax with right-sided mediastinal shift Ultrasonography: Left pleural effusion with a mass replacing lung parenchyma CT scan: Large soft tissue mass in the left pleural cavity with compression of the adjacent lung parenchyma 99M-TC-MAA lung perfusion scan: A reduced perfusion in lower two-thirds of the left lung	Spindle cell tumor with areas of dense sclerosis	CTR	NS
Thakkar *et al.* (2011)[13]	43/F	Left hemithorax	Progressive breathlessness on exertion, dry cough, and weight loss of 4 months duration	15×14×10.2 cm/NS	Chest X-ray: Homogeneous opacity in the left lower and mid zones with a mediastinal shift to the right CT scan: Large mass showing heterogeneous enhancement more in the periphery in the left hemithorax measuring 13.1×15.6×18.9 cm in its antero-posterior (AP), transverse, and vertical dimensions, respectively. The mass had well demarcated margins and displaced the trachea and mediastinum to the right. The left lower lobe seen adjacent to it was atelectatic. Few calcific densities and a focus of hyperdensity were observed in the mass on plain scans. Multiple vessels were observed in the mass on postcontrast images, and the tumor abutted the pericardium and displaced the pulmonary artery and pulmonary veins medially PET: Low grade diffuse fluoro deoxy glucose (FDG) (maximum standardized uptake value/max SUV 1.7) in the mass	Collagen forming low grade spindle cell lesion	CTR	Uneventful postoperatory recovery

Contd...

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Authors	Age/sex	Anatomic site	Symptoms	Size/weight	Radiological findings	Percutaneous needle biopsy	Treatment	Follow-up
Trivino *et al*. (2011)[14]	60/F	Right hemithorax	Exertional dyspnea of 1 year's standing	30×15×20 cm/3560 g	Chest X-ray: Large tumor mass in the right hemithorax CT: Tumor mass measuring 30×15×20 cm, possibly arising from the diaphragmatic pleura surface; mediastinal structures were displaced, CT density was heterogeneous, and there was evidence of focal necrosis, cystic degeneration and gross calcifications measuring around 1 cm, and extending to the right renal fossa	NS	CTR	NS
Furukawa *et al*. (2011)[15]	57/M	Left thorax	Progressive general malaise for a month	20×19×15 cm/2150 g	Chest X-ray: Giant tumor in the left thorax CT scan: Well circumscribed homogeneous mass which compressed the descending aorta	Fibrotic tissue without evidence of malignancy	CTR	NS
Kaur *et al*. (2012)[1]	39/M	Left pleural cavity	Low-grade continuous fever over a period of 1 month and mild discomfort left lower side of the chest	23×21×0.9 cm/2 kg.	Chest X-ray: Features suggestive of a loculated pleural effusion with pleural thickening on the left site Ultrasonography: A huge mass in the left pleural cavity abutting the chest wall Contrast CT scan: Large heterogeneous enhancing mass of soft tissue density in the left hemithorax. The mass appeared smooth, well-defined, and lobulated, with no evidence of chest wall or mediastinal invasion, or significant associated mediastinal shift. The visualized angle of contact with the pleura on the chest PA radiograph appears obtuse, while on the CT, the angle formed with lateral chest wall is acute	Benign spindle cells	CTR	NS
Gorospe (2012)[16]	48/F	Left lower hemithorax	Chronic cough dyspnea	24 cm MD/NS	Whole-body contrast PET/CT: Large mass with relatively uniform mild FDG uptake (standardized uptake value=1.8). No signs of infiltration, pleural effusion, significant regional lymph nodes, or extrathoracic lesion were observed	Benign SFT	CTR	NS

M: Male; F: Female; *years; NS: Not specified; MD: Maximum diameter; CTR: Complete total resection; P: Pneumonect; SFT: Solitary fibrous tumor; CT: Computed tomography

taken from the literature and reported eight new cases. These authors examined clinical findings, gross, light and electron microscopic findings of the tumors but the radiological features were not reported. In England *et al.*'s study[2] a CT scan was been performed only in two cases. Cardillo *et al*.[6] examined 55 cases of SFTPs but distinction between benign and malignant lesions was not been made. The radiological findings of giant benign SFTPs have been reported with accuracy only in single cases or small series [Table 1].[1,5,7-16] In the large collected review series the radiology of large SFTPs has been reported in the "Results" section of the paper. But specific radiological characteristics of >15 cm SFTPs have been described with accuracy only in few cases. In conclusion CT scan is the diagnostic preoperative procedure of choice for benign SFTP. CT scan may establish the complete excision of the lesion and the presence of a distinct peduncle. Fine needle-aspiration biopsy is not a reliable diagnostic tool.[17] Symptomatic presentation and the impression of a nonpleural tumor by CT have been reported to be related to a malignant pathologic diagnosis.[18]

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