Lung schwannomas, an unusual entity: A series of five cases

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ABSTRACT

Schwannomas are benign slow-growing tumours arising from the Schwann cells of the nerve sheath. They may arise anywhere in the course of the nerves in the body. The clinical presentations are non-specific, and when present in rare locations such as lungs, the diagnosis becomes difficult. The present case series describes the clinical presentation and diagnosis of five cases of lung schwannoma. The diagnosis was mainly assisted by the immuno-histochemical examination comprising markers such as S-100, Calretinin, CD34, CD56, Desmin, and EMA. A definitive diagnosis of benign nerve tumours in such rare locations may help in better pre-operative assessment and surgery for complete recovery of the patients.

KEY WORDS: Lung, pulmonary, schwannomas

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INTRODUCTION

Schwannomas/neurilemomas/neurinomas are encapsulated, benign, slow-growing tumours of neural origin, that is, Schwann cells, that cover the axons of nerves of periphery, cranium, and the autonomic nervous system (ANS).[1] They may occur in various locations such as the neck, arms, mediastinum, and retroperitoneum.[2] Lung is one of the rare sites as noticed for schwannoma.[3,4] Schwannoma in the lung can be intra-pulmonary or endobronchial.[2] Barring few case reports, there has been no extensive literature on schwannomas in lungs.[1-7] This accounts for the rare incidence of schwannomas in lungs, comprising 0.2% of the lung tumours.[8]

The sporadic nature of the tumours, late presentation, and non-specific signs and symptoms make the diagnosis and reporting a daunting task.[2] Though they are amenable to surgery, because of the rarity of the location, the pre-operative clinical and imaging findings have not been completely elucidated. We report here a series of five cases of lung schwannomas in adults.

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CASES

Case 1

A 37-year-old female presented with fever and dry cough for 6 months. Computed tomography (CT) scan of the lung showed a right upper lobe mass of 2.5 × 1 cm with right-sided hilar lymphadenopathy [Figure 1]. CT-guided biopsy was performed. On hematoxylin and eosin (H and E), the tumour was composed of fasciles

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of benign spindle cells with no mitosis or necrosis. A provisional diagnosis of schwanoma was made. The sections went through immuno-histochemical **(**IHC) examination with a panel of markers (S-100, Calretinin, Vimentin, and CD56). The spindle cells were strongly positive for S-100 and Calretinin, and the tumour was finally diagnosed as lung schwannoma.

Case 2

A 50-year-old man presented to the hospital with chronic cough and a mass lesion on chest X-ray [Figure 2]. On contrast-enhanced computed tomography (CECT), a large contrast-enhanced soft tissue density (HU + 67) mass measuring 89 × 82 × 70 mm was seen in the right lower lobe anterior basal segment in the paricardium and diaphragm [Figure 3a]. His left lung was normal with no mediastinal lymphadenopathy or pleural effusion.

On gross examination, the resected tumour demonstrated a well-defined round tumour in the lung; no invasion was present in the adjacent tissues. The color of the cut surface was yellowish white.

H and E section showed proliferated elongated spindle-shaped tumour cells having a round to oval centrally placed nucleus with cellular palisading at places [Figure 4]. There was no necrosis, atypia, or mitotic figures.

IHC staining showed tumour cell positivity for S-100 and calretinin, with negative stain for desmin and CD56. A final histopathological diagnosis of intra-pulmonary schwannoma was made.

Case 3

A 60-year-old male ex-smoker presented with dyspnoea and chest pain for 2 months. His complete blood counts and routine tests were within normal limits. On CT scan chest, a well-defined heterogeneously enlarged lesion was present in the apical segment of the upper lobe of the right lung, which suggested Pancoast tumour [Figure 5]. In addition, there were multiple enlarged pre-tracheal and para-tracheal lymph nodes.

The patient was planned for CT-guided biopsy, which was uneventful. On histopathologic examination of the biopsy, tumour composed of bland-looking spindle cells arranged in fascicles with peripheral palisading of nuclei was seen in a myxoid background [Figure 6]. The tumour did not show increased mitotic activity. Lymph nodes were free of tumour.

IHC showed strong positivity for S100 protein; negative staining was in the case of epithelial membrane antigen as well as CD34. A final histopathological diagnosis of schwannoma was made primary to lung.

Case 4

A 23-year-old male, smoker, presented with dyspnoea and chest pain for 3 months. X-ray showed a mass which was confirmed on chest CT as a well-defined smoothly enhancing lesion in the right apical lung abutting superior vena cava superiorly likely neurogenic in origin, for which magnetic resonance imaging (MRI) was advised [Figure 3b]. MRI showed a right pleura-based right lung heterogeneous mass lesion, likely Pancoast tumour. The tumour was excised and sent for histopathology. The gross specimen revealed a single globular tissue structure measuring 7.9 × 5 × 3 cm. The external surface was well encapsulated. On serial slicing, it was gray white to gray brown. Histopathological sections showed features of schwannoma with cystic change.

Case 5

A 38-year-old female, non-smoker, presented with tightness in chest and difficulty in breathing for 1 month. The pleural fluid was collected, which was negative for malignant cells and showed lymphocytes. An enhancing lesion in the left lower lobe lung with basal atelectasis was identified. Image-guided biopsy was performed, which

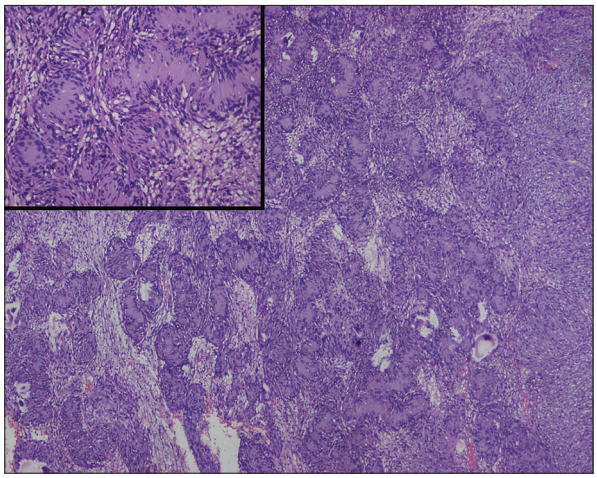

Figure 1: H and E (100x) showing compact hyper-cellular Antoni A areas and myxoid hypo-cellular Antoni B areas and the inset (400x)

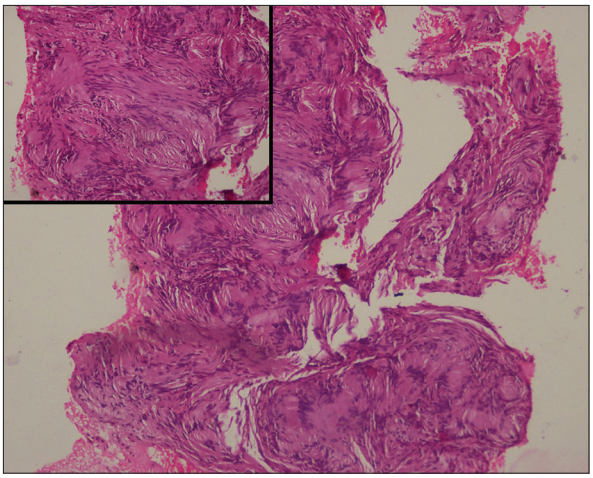

Figure 2: H and E (100x) showing spindle cell lesion with cellular palisading areas in the inset (400x)

showed benign spindle cell neoplasm highly suggestive of schwannoma. IHC showed S100 positivity [Figure 7].

DISCUSSION

Schwannoma is an extreme rare finding in the lung (0.2% of the total pulmonary neoplasms), irrespective of the age of patients. Our series includes patients with the age varying from young to elderly with the youngest patient being 37 years old and the oldest being 60 years old. There were two males and one female. The literature records lung schwannoma with varied age distribution and no predilection for age, gender, or smoking status of the patients [Table 1].[2-8]

The clinical features may include dyspnoea and cough. However, in the majority of the patients having peripheral intra-pulmonary schwannoma, there are no symptoms.[5]

In our cases, the patients had mild symptoms of cough and difficulty in breathing and consequent CT showed lung masses in the apical regions or the lower lobes. On radiography, a peripheral intra-pulmonary schwannoma presents as a round mass having well-demarcated margins,[8] possibly showing a "split fat" sign (that appears as fat attenuation around the lesion) because of displaced but intact surrounding fat, which encloses the neuro-muscular bundle, indicating a non-infiltrating neurogenic mass.[9,10]

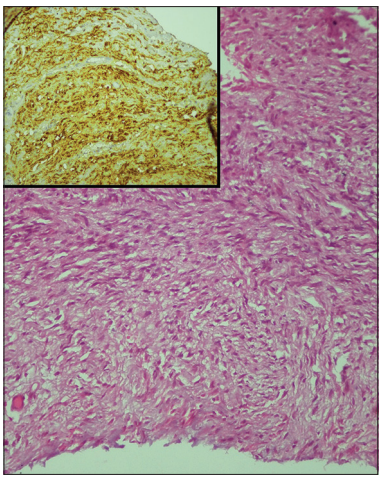

Figure 3: H&E (100x) with the inset showing S-100 strong positivity (Case 5)

Low-attenuation areas corresponding to fat or cystic degeneration may be present. Calcification can be found in nearly 10% of the total cases of schwannomas, often in a peripheral pattern, especially in cases of long-term lesions having advanced degeneration (supposed to be known as ancient schwannomas).[11]

It is possible that osseous pressure erosion is present. Because of the cystic as well as haemorrhagic changes, CECT demonstrates homogeneous enhancement in the case of a small mass and more heterogeneous enhancement in the case of a large-sized schwannomas.

On MRI, low-intermediate signal intensity is displayed on T1-images and high-signal intensity is displayed on T2-images. Gadolinium-enhanced imaging shows solid components' intense enhancement.[12]

The larger the size of schwannoma, the more heterogeneous it appears on all sequences (comprising gadolinium-enhanced images) because of the cystic degeneration, haemorrhage, or both. However, our study investigations were restricted only to CT scan and no MRI or positron emission tomography scan was performed.[13]

Histologically, schwannomas comprise Schwann cells that are organized in highly cellular distribution (Antoni A) or a loose myxoid component (Antoni B). The shape of schwannomas is fusiform and eccentrically situated nearby the involved nerve. The schwannoma and the affected nerve are enclosed within the true capsule (called as the epineurium).[11] Grossly, thoracic schwannomas are generally found to be marginated, spherical, and lobulated or dumbbell-shaped paraspinous masses, which span one to two posterior rib interspaces but can achieve a large size. In the case of being large-sized, such tumours are found to be nerve-eccentric with lobulations and cyst.[14] The findings were observed in our study.

All cases underwent histopathological examination, but the biopsy (H and E) characteristics of the nerve tumour fall under a differential of plethora of diagnosis (D/D) such as schwannoma, neurofibroma, neuroblastoma,

Table 1: Literature records lung schwannoma

Studies	No. of cases	Mean age (years)	Gender	Clinical findings
Our study	5	37 years	Female	Fever, dry cough (6 months)
		50 years	Male	Chronic cough
		60 years	Male	Dyspnoea, chest pain (2 months)
		23 years	Male	Dyspnoea, chest pain (3 months)
		38 years	Female	Chest tightness, difficulty in breathing (1 month)
Imen *et al*.[2] (2021)	1	60	Male	Chest pain, dyspnoea (3 months)
Gültekin *et al*.[5] (2020)	1	39	Male	Increased dyspnoea with effort
Savu *et al*.[7] (2020)	1	60	Male	Diminished tolerance to physical activity in the last few weeks and mild dyspnoea
Lococo *et al*.[6] (2015)	1	67	Male	Persistent cough
Yukawa *et al*.[3] (2014)	1	38	Male	Asymptomatic
Domen *et al*.[4] (2010)	1	75	Female	Asymptomatic

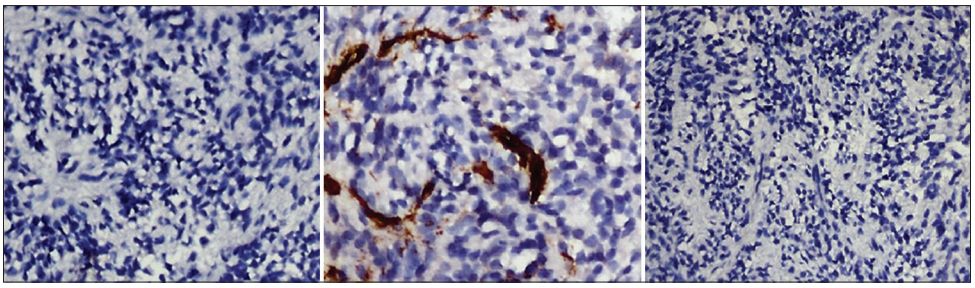

Figure 4: IHC (100x) showing vimentin negative, CD34 negative, and SMA negative

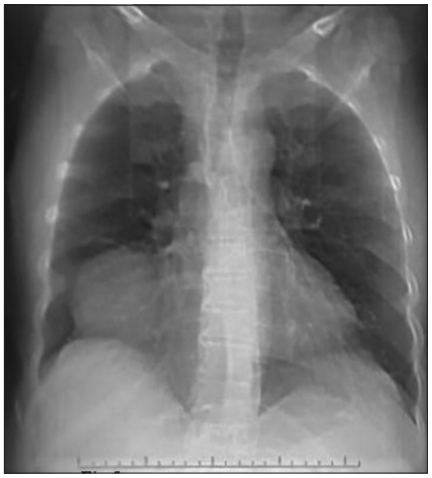

Figure 5: X-ray: Chest X-ray (PA view) showing well-defined opacity in the right lower zone in the para-cardiac region silhouetting Rt. cardiac border (Case 2)

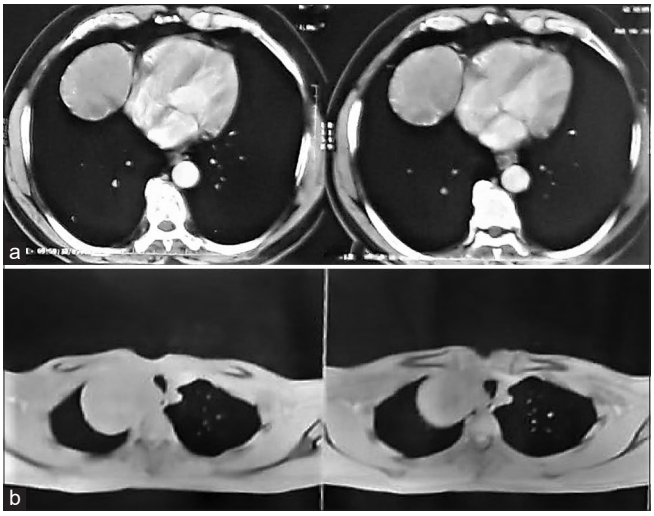

Figure 6: Case 2 Ct: two axial CECT images showing a) Homogeneously enhancing Rt para-cardiac lung mass (Case 2). b) Lung window showing a soft tissue density lung mass in the Rt. apical region (Case 4)

paraganglioma, ganglioneuroma, leiomyoma, gastro-intestinal stromal tumour (GIST), and malignant peripheral nerve sheath tumour (MPNST).[11,15]

Palisading of nuclei is not an uncommon finding in the case of schwannoma. It may also be found in GIST, leiomyosarcoma, leiomyoma, calcifying aponeurotic fibroma, and non-neoplastic smooth muscle lesion. Because of rare existence of plexiform areas in schwannoma, they may be incorrectly considered as neurofibroma. Certain schwannomas are highly cellular, pleomorphic, and mitotically active and can be mistaken for sarcomas.[15]

Therefore, IHC has an adjunctive role in the differentiation of neural fusiform tumours. The markers that are used in IHC are CD117, CD56, CD34, S100, Calretinin, Desmin, Vimentin, EMA, and smooth muscle antigen.[7,15] Calretinin is found to be very specific to schwannomas and absent in neurofibromas; in 77% of the schwannomas, CD56 is present. In 80% of the neurofibromas, CD34 is present.[16] In contrast, immuno-reactivity to S100 protein appears similar in schwannomas as well as neurofibromas.[7]

It must be stressed here that while making a diagnosis of schwannoma in the lung, one must not miss the synchronous cases of primary lung cancer.[6] The histopathology sections must be thoroughly screened for such cases. Second, the giant size of the tumour must not be mistaken for malignancy as was the case reported by Savu *et al*.[7]

For malignancy, features sought include improved cellularity, greater mitotic figures (>4/10 high-power fields), local invasion, bone tissue destruction, lung metastases, or pleural effusions.[7]

Rarely, schwannomas can become malignant over time. The expression level of Ki67, which is marker of tumour cell proliferation, is helpful for predicting the malignant potential of such tumours.[3] In the study by Kindblom *et al*.,[17] the Ki67 expression level was compared among MPNSTs (n = 26) and benign nerve sheath tumours (schwannomas) (n = 24); it was found that there was a significantly high density of nuclear staining in MPNSTs.

On a follow-up of 2 years, none of the patients presented with malignant transformation and are faring well post-operatively.

Treatment of primary intra-pulmonary schwannoma includes surgical resection, intra-bronchial resection with endoscopy, and YAG (yttrium aluminium garnet) laser

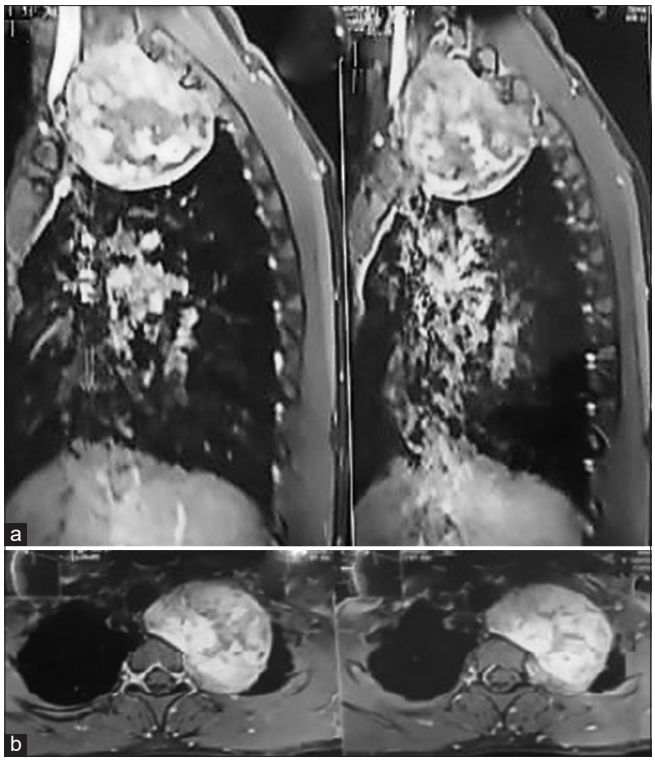

Figure 7: Axial CEMRI showing the left apical heterogeneously enhancing lung mass

resection. Because these tumours have low malignant potential, partial lung resection or tumour enucleation is believed to be appropriate, and lobectomy is not essential.[3]

CONCLUSION

To conclude, in the present study, five cases of intra-pulmonary schwannoma are reported, which is very rare. Because the symptoms as well as CT manifestations are not specific, pre-operative diagnosis may be challenging. Biopsy and IHC play the key role in making the final diagnosis that is beneficial for a complete resection and better outcome of the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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