INDIAN HEART JOURNAL 66 (2014) 535–538

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/ihj

Case Report

Regression of pulmonary artery hypertension due to development of a pulmonary arteriovenous malformation

Ashfaq Hasan [a,b,*], *B.K.S. Sastry* [c], *M.A. Aleem* [d], *Gokul Reddy* [e], *Syed Mahmood* [f]

[a] *Professor and Head, Department of Pulmonary Medicine, Deccan College of Medical Sciences/Owaisi Hospital, Hyderabad, India*

[b] *Consultant Pulmonologist, Care Institute of Medical Sciences (Banjara), Hyderabad, India*

[c] *Consultant Cardiologist, Care Institute of Medical Sciences (Nampally), Hyderabad, India*

[d] *Assistant Professor, Department of Pulmonary Medicine, Deccan College of Medical Sciences/Owaisi Hospital, Hyderabad, India*

[e] *Consultant Cardiologist, Care Institute of Medical Sciences (Musheerabad), Hyderabad, India*

[f] *Senior Resident and Tutor, Department of Pulmonary Medicine, Deccan College of Medical Sciences/Owaisi Hospital, Hyderabad, India*

Keywords:
Pulmonary arterial hypertension
Arterio-venous malformation
Hemoptysis
Pregnancy
Regression

ABSTRACT

Idiopathic Pulmonary Hypertension (IPAH) is characterized by elevated pulmonary arterial pressure in the absence of an identifiable underlying cause. The condition is usually relentlessly progressive with a short survival in the absence of treatment.[1] We describe a patient of IPAH in whom the pulmonary artery pressures significantly abated with complete disappearance of symptoms, following spontaneous development of a pulmonary arterio-venous malformation (PAVM).

1. Introduction

Pulmonary artery hypertension (PAH) is a disease that carries a poor prognosis.[1] While specific therapy targeting the pulmonary vasculature does improve symptoms and prolong life, the condition progresses regardless of treatment. We report a case of a young woman with PAH who had complete remission of her symptoms with improvement in her pulmonary artery pressures following spontaneous development of a pulmonary artery venous fistula.

2. Case presentation

A 26 year old housewife was referred to our centre for evaluation. Five years earlier she had developed progressive dyspnea on exertion with one episode of pre-syncope while

* *Corresponding author*. Department of Pulmonary Medicine, Owaisi Hospital and Research Centre/Deccan College of Medical Sciences, DMRL Crossroads, Santosh Nagar (Kanchanbagh), Hyderabad 500058, India. Tel.: +91 9848251708 (mobile), +91 9848051708 (mobile).
E-mail addresses: ahpulmo@gmail.com, ashfaqhasanmd@gmail.com (A. Hasan).

http://dx.doi.org/10.1016/j.ihj.2014.09.001

walking up an incline. She was a non-smoker, and had never taken any anorectic drugs. There was no history of similar disease in her family. Physical examination revealed no visible cutaneous telangectasiae. She had undergone a comprehensive workup which included spirometry, HIV serology and collagen vascular profile, all of which proved non-diagnostic.

At the time of initial workup, she underwent a chest X-ray (Fig. 1b) and chest CT-pulmonary angiography [CTPA] (Fig. 1b), both of which revealed dilatation of the pulmonary vasculature as also the right heart chambers. *ECG* showed right-axis deviation of QRS complex with right ventricular hypertrophy; *Echocardiogram* showed dilated right atrium, right ventricle and pulmonary arteries, and mild tricuspid regurgitation. The estimated pulmonary artery systolic pressure (PASP) based on tricuspid regurgitation jet velocity was 80 mmHg. There were no evidence of any cardiac shunt lesions and biventricular function was normal. *Right heart catheterization* done at that time confirmed pulmonary artery hypertension with a negative vasodilator challenge.

Following this the patient was commenced on oral sildenafil citrate (25 mg thrice daily). She was advised against becoming pregnant.

A year later (about4 years before presentation to our institute), she had four episodes of mild hemoptysis, following which she was re-investigated. All investigations showed results that were more or less identical to those before, except that the *echocardiogram* now showed paradoxical septal motion with TR, and the estimated PASP had risen to 80 mmHg. Without any other apparent etiology, the hemoptysis was ascribed to the PAH, and the dose of sildenafil was increased to 50 mg thrice daily.

Over the next couple of years, the patient conceived twice. Echocardiograms that were done as part of her antenatal workup showed severe PAH, with PASPs ranging from 80 to 85 mmHg; on both occasions, she was persuaded to terminate her pregnancy.

Subsequently, her dyspnea began to improve, and about a year and a half before her presentation to us, her PASP had decreased to 65 mmHg on echocardiography. About a year before her first visit to our institute, the PASP had further declined to 46 mmHg, and the echocardiogram now revealed only mild dilatation of right heart chambers. Commensurately, her ECG showed decrease in right axis and right ventricular forces.

A re-evaluation once again failed to reveal an underlying cause. The patient conceived once again (for the third time), but this time spontaneously aborted at 6 weeks' gestation.

At this time she presented at our institute. She was less symptomatic than before. We noticed a small opacity in the left mid zone in one of herrecent chest radiographs (Fig. 2b), which had possibly escaped detection earlier (Fig. 2a-open arrow).

A repeat CTPA revealed a large arteriovenous malformation measuring 33 × 36 × 30 mm in the left lower lobe (Fig. 3). The study was negative for pulmonary thromboembolism. Echocardiography showed a normal RA and RV size and no PAH. The patient was reoffered a repeat right heart catheterization, but refused.

3. Discussion

The clinical course in this patient is remarkable. IPAH is a disease which inexorably progresses, and seldom if ever, remits.[2] However after progressively worsening for a few years, her symptoms steadily abated, with a commensurate improvement on serial echocardiograms. The high PASPs during the initial course of her illness, as indeed their later fall were confirmed by different observers on each occasion. The decrease in right ventricular forces on ECG also supports this. Unfortunately, the patient refused right heart catheterization.

We believe that the fall in the PA pressures of this magnitude is due to the development of a PAVM, resulting in a low-resistance circuit. Sildenafil treatment generally improves symptoms, but does not decrease pulmonary artery pressures to such an extent.[3]

Hemoptysis is a recognized finding in PAH. It is conceivable that the episodes of hemoptysis could have resulted from tiny sub-radiological PAVMs.[4] We believe that the enlarging high-flow, low-resistance PAVM could have significantly contributed to the improved hemodynamics in this patient, and limited the progression of PAH.

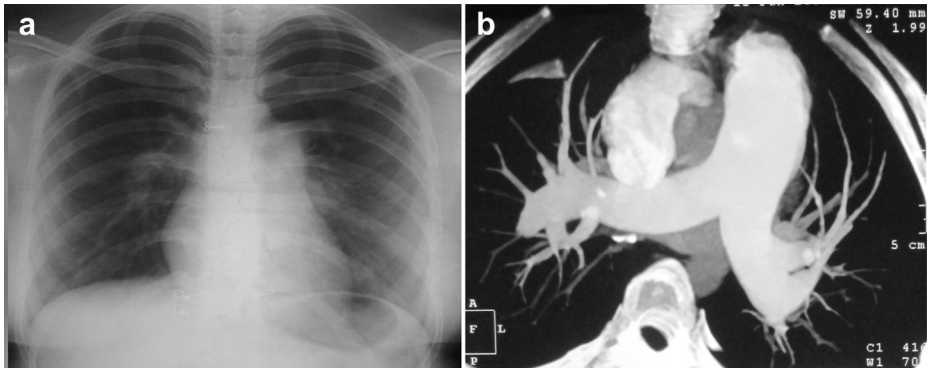

Fig. 1 – (a) Postero-anterior chest film of the patient (done at initial workup of the patient, five years before presentation to our institute), showing dilated pulmonary vasculature with peripheral pruning. (b) CT pulmonary angiogram (done during the same period) showing prominent main, left and right pulmonary arteries and dilated right heart chambers.

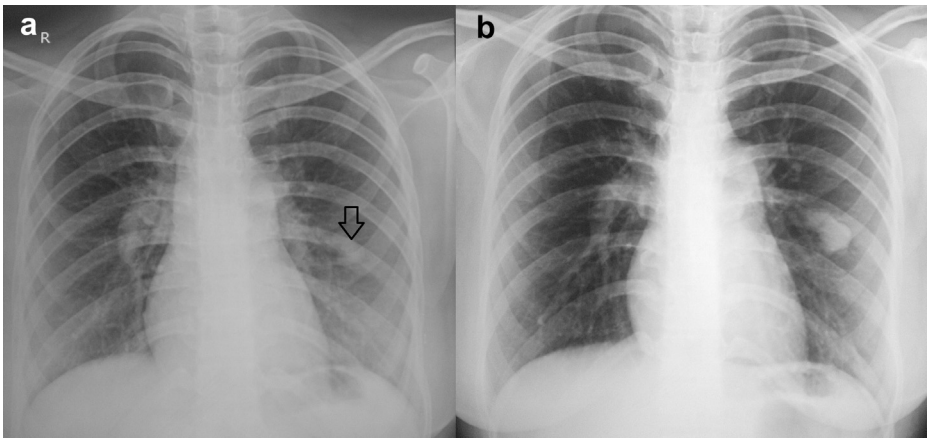

Fig. 2 – (a) Chest radiograph done about a year and a half before presentation shows a lobulated opacity in the left mid zone (open arrow). This had possibly escaped detection of the observer at this time. (b) Chest radiograph done at presentation to our institute. The lobulated opacity in the left mid zone is seen to be much more prominent than in the film (Fig. 2a) done a year and a half ago.

Such a decline in PAH with the recruitment of PAVMs has been described in dogs with *Angiostrongylus vasorum* infection.[5] Sperling et al[6] described two cases of multiparous women with PAH who subsequently developed PAVMs: in one of these, the mean PA pressures decreased after the PAVM developed. Minai et al described a woman with hereditary haemorrhagic telangiectasia (HHT) and PAH,[7] in whom a decrease in PA mean pressure and stabilization of the clinical course occurred *parri passu* with the development of PAVMs, while on therapy with pulmonary vasodilators.

Small arteriovenous fistulae can exist at the apices of segmental subdivisions in proximity to the visceral pleura—precisely where clinically significant PAVMs are prone to occur.[8] These could enhance in their size secondary to increasing mean PA pressures.[9] Rupture of hypoplastic vascular septa under increased pressure conceivably contribute to an increase in the size of AV malformations.[6]

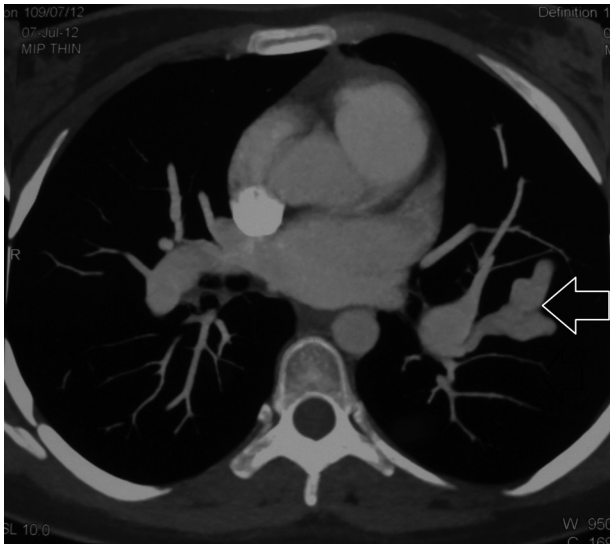

Fig. 3 – A CT-Pulmonary angiogram (CTPA) at presentation shows a large irregular lobulated aneurismal dilatation measuring 33 × 36 × 30 mm in the left lower lobe fed by the left inferior pulmonary artery and draining into the left inferior pulmonary vein. This study, like the initial CTPA, was negative for any pulmonary thromboembolic process.

Solitary or multiple PAVMs can occur as part of Hereditary Haemorrhagic Telangectasia (HHT), where they are indistinguishable from idiopathic PAVMs (idiopathic PAVMs tend to be solitary while those in HHT are generally multiple and bilateral).[10] The association of PAVMs with PAH can be on account of genetic mutations than predispose to both diseases or where the PAH may promote enlargement of the PAVM. In one study HHT occurred within 4 of 104 families with PAH.[11] It is relevant that mutations at *ENG, ACVRL1* are associated with *both* HHT and familial PAH; mutations of another TGF superfamily member gene (BMPR2) are associated with familial PAH.[12] Our patient showed no clinical features of HHT. Unfortunately facilities for genetic studies are currently not available at our centre.

All patients with significant PAVMs should normally be considered for endovascular closure or surgical removal. This may be critically important for an impending pregnancy (given that no PAH exists to contraindicate pregnancy). During the latter half of pregnancy, PAVMs can bleed or even rupture with disastrous consequences. However in the context of PAH, therapeutic obliteration of the low resistance channel afforded by the PAVM could also be catastrophic. Indeed, embolization or resection of a PAVM has resulted in fatality.[12]

This patient was stringently advised against becoming pregnant. It was considered prudent to continue the sildenafil. A repeat right heart catheterization and genetic studies would have been ideal.

4. Conclusion

PAVMs can rarely occur in association with PAH. Tiny areas of weakness in the pulmonary vasculature can enlarge in size

secondary to the increased pulmonary artery pressure. In rare cases such as this, the PAVM may halt or delay the progression of an otherwise unremitting condition.

Conflicts of interest

All authors have none to declare.

REFERENCES

1. McLaughlin VV, Archer SL, Badesch DB, et al. ACCF/AHA 2009 expert consensus document on pulmonary hypertension a report of the American College of Cardiology Foundation Task Force on Expert Consensus Documents and the American Heart Association developed in collaboration with the American College of Chest Physicians; American Thoracic Society, Inc.; and the Pulmonary Hypertension Association. *J Am Coll Cardiol*. 2009;53:1573.
2. Fujii A, Rabinovitch M, Matthews EC. A case of spontaneous resolution of idiopathic pulmonary hypertension. *Br Heart J*. 1981;46:574–577.
3. Rubin LJ, Badesch DB, Fleming TR, et al. Long-term treatment with sildenafil citrate in pulmonary arterial hypertension: the SUPER-2 study. *Chest*. 2011 Nov;140:1274–1283.
4. Pierucci P, Murphy J, Henderson KJ, Chyun DA, White Jr RI. New definition and natural history of patients with diffuse pulmonary arteriovenous malformations: twenty-seven-year experience. *Chest*. Mar 2008;133:653–661.
5. Matos JM, Schnyder M, Bektas R, et al. Recruitment of arteriovenous pulmonary shunts may attenuate the development of pulmonary hypertension in dogs experimentally infected with *Angiostrongylus vasorum*. *J Vet Cardiol*. 2012;14:313–322.
6. Sperling DS, Cheitlin M, Sullivan RW, Smith A. Pulmonary arteriovenous fistulas with pulmonary hypertension. *Chest*. 1977;71:753–757.
7. Minai OA, Rigelsky C, Eng C, Arroliga AC, Stoller JK. Long-term Outcome in a patient with pulmonary hypertension and hereditary hemorrhagic telangiectasia. *Chest*. 2007;131:984–987.
8. Anabtawi IN, Ellison RG, Ellison LT. Pulmonary arteriovenous aneurysms and fistulas: Anatomical variations, embryology, and classification. *Ann Thorac Surg*. 1965;1:277–285.
9. Ellison LT, Hall DP, Yeh T, et al. Physiological alterations in increased pulmonary blood flow with and without pulmonary hypertension. *J Appl Physiol*. 1961;16:305–308.
10. Trembath RC, Thomson JR, Machado RD, et al. Clinical and molecular genetic features of pulmonary hypertension in patients with hereditary hemorrhagic telangiectasia. *N Engl J Med*. 2001;345:325–334.
11. Abdalla SA, Gallione CJ, Barst RJ, et al. Primary pulmonary hypertension in families with hereditary haemorrhagic telangiectasia. *Eur Respir J*. 2004;23:373–377.
12. Gossage JR, Kanj G. Pulmonary arteriovenous malformations. A state of the art review. *Am J Respir Crit Care Med*. 1998;158:643.