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Case report

Palliative embolisation for intrapulmonary shunting in lepidic predominant adenocarcinoma of the lung

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ABSTRACT

Lepidic predominant adenocarcinoma (LPA) (formerly known as bronchioalveolar carcinoma) has rarely been reported to cause refractory hypoxia with intrapulmonary shunting [1–7]. We describe a case who underwent the palliative strategy of intravascular right lower pulmonary artery embolisation with an 18 mm Amplatzer II vascular plug to reduce intrapulmonary shunting. This is the first report we are aware of using this minimally invasive procedure to treat this condition.

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1. Clinical record

A 64 year old man presented with haemoptysis and refractory hypoxia (pO₂ 41 mmHg on FiO₂ 0.8) following a short flight. He was transferred for palliation closer to home. His history included 50 pack years smoking, asbestos exposure and weight loss. CT thorax (See Fig. 1) revealed extensive, dense consolidation of both lungs, bilateral hilar and subcarinal adenopathy, and centrilobular emphysema, but with no distant metastases evident. Sputum cytology reported atypical cells, favouring adenocarcinoma. He was polycythaemic with a haemoglobin of 203 g/L. He received antibiotics to treat any infective component, and glucocorticoids but without significant improvement. His oxygen saturations remained between 70 and 80% despite high flow oxygen. He was too unwell

for further invasive investigations such as biopsy, or treatment such as chemotherapy (unknown ALK and EGFR status). He sought palliation and was discharged home with home oxygen approximately 10 L/min achieved via OxyMask with 2 connected oxygen concentrators.

8 months after initial diagnosis, he remained hypoxic, although his general condition remained stable (ECOG performance status 3) with no evidence of other end organ dysfunction. He was re-evaluated with CT scans, respiratory function tests, arterial blood gases, VQ scan, bubble contrast echocardiogram and a 100% oxygen shunt study. The calculated shunt fraction was 25% (pO₂ 54.1 on 100% O₂, PCO₂ 38.9, SaO₂ 88%, Hb195). There was no evidence of extra-pulmonary shunting. The VQ scan revealed marked perfusion to the unventilated right lower lobe, consistent with significant intrapulmonary shunting. Distant metastases were not detected and there was only marginal progression of his extensive consolidation to both lungs. Given his poor pulmonary reserve, biopsy for EGFR and ALK status was not undertaken. However after multi-disciplinary discussion, the feasibility of a palliative procedure to reduce the shunt and hopefully improve his oxygenation and quality of life was considered.

With informed consent, he underwent pulmonary angiography with intrapulmonary catheterisation and temporary occlusion of the right inferior pulmonary artery which improved oxygen

Abbreviation List: LPA, lepidic predominant adenocarcinoma; CT, computed tomography scan; ECOG, Eastern Cooperative Oncology Group performance status; VQ, ventilation-perfusion scan.

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saturations from 79% to 82%. Subsequent embolisation of his right lower lobe pulmonary artery with an 18 mm Amplatzer vascular plug II device was then performed. (See Fig. 2) He improved clinically although the dramatic improvement in oxygenation was not sustained with SaO₂ decreasing to 78–81% on 10 L O₂ within 1 day. Repeat VQ scanning 3 days later confirmed reduced perfusion of the non-ventilated posterobasal and lateral basal segments of the right lower lobe compared with the pre-procedural scan. However there was still flow to the superior and anterobasal segments of the right lower lobe. (See Fig. 3). He remained stable and was discharged home 5 days post procedure. He reported marked symptomatic improvement in his ability to carry out activities of daily living. His home monitored peripheral SaO₂ were between 71 and 96 % with a median of 86%. He subsequently died 3 months later from a complicated pneumothorax and pulmonary embolism.

Autopsy revealed extensive LPA involving all lobes of both lungs as well as hilar, mediastinal and retrosternal lymph nodes. There was a right upper lobe pulmonary embolus and a left upper lobe abscess colonised by aspergillus. The Amplatzer vascular plug was identified within a large vessel at the boundary of the right lower and middle lobes, with no evidence it contributed to his death.

2. Discussion

This is the first report we are aware of to use this minimally invasive, palliative procedure to improve shunting within a lung adenocarcinoma (lepidic predominant). There are few literature reports of LPA with refractory hypoxia from intrapulmonary shunting [1–7]. 5 reports have described 10 patients who

underwent palliative surgery to correct the intrapulmonary shunt and hypoxia (see Table 1) [1–5]. Survival post resection ranged from 21 days to 24 months [1–5]. Some underwent chemotherapy and/or radiation therapy [1–5]. One patient even proceeded to

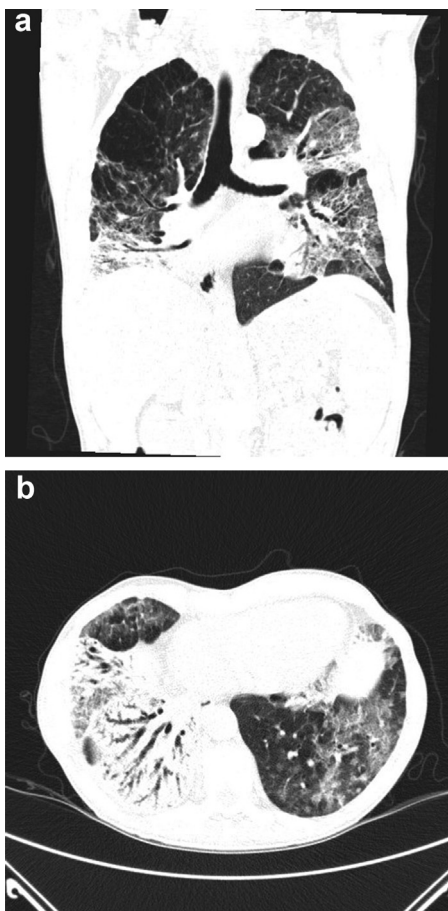


Fig. 1. a) CT coronal view, b) CT axial view.

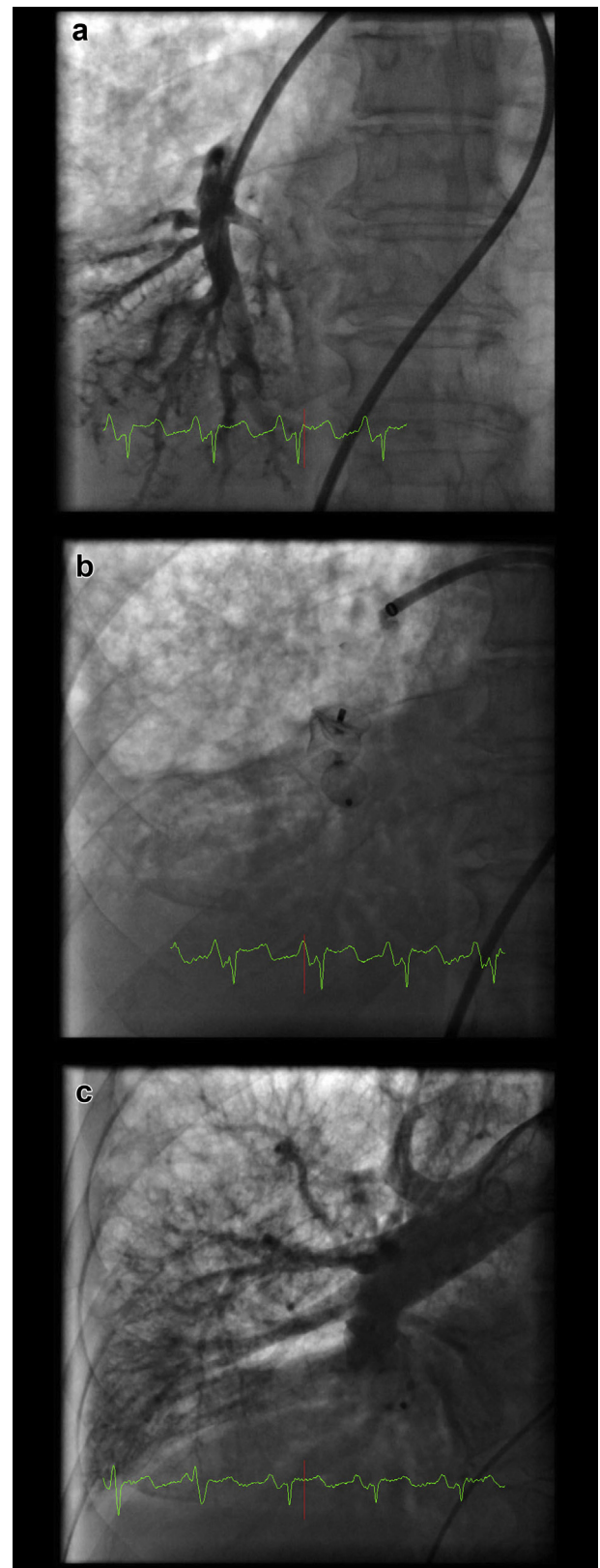


Fig. 2. a) Pre vascular plug, b) vascular plug profile, c) post.

subsequent lung transplantation [3]. Intrapulmonary shunting has also been reported in squamous cell carcinoma and carcinoid of the lung [8–11].

It is uncertain why our patient's initial dramatic oxygenation improvement was not sustained. Imaging did not reveal significant movement of the Amplatzer plug. Perhaps with his extensive bilateral lung disease, the moderate perfusion correction to un-ventilated lung was not enough to clearly demonstrate pO₂

improvement. Despite no sustained improvement in oxygen saturation, he felt better and was more able to perform his activities of daily living. Unfortunately formal assessments of quality of life were not undertaken before and after the intervention.

The total cost of the Amplatzer II vascular plug and associated procedural costs is estimated at \$1500, and bed costs approximately \$2000. His home oxygen usage was unchanged but the palliative benefits of improving quality of life must not be

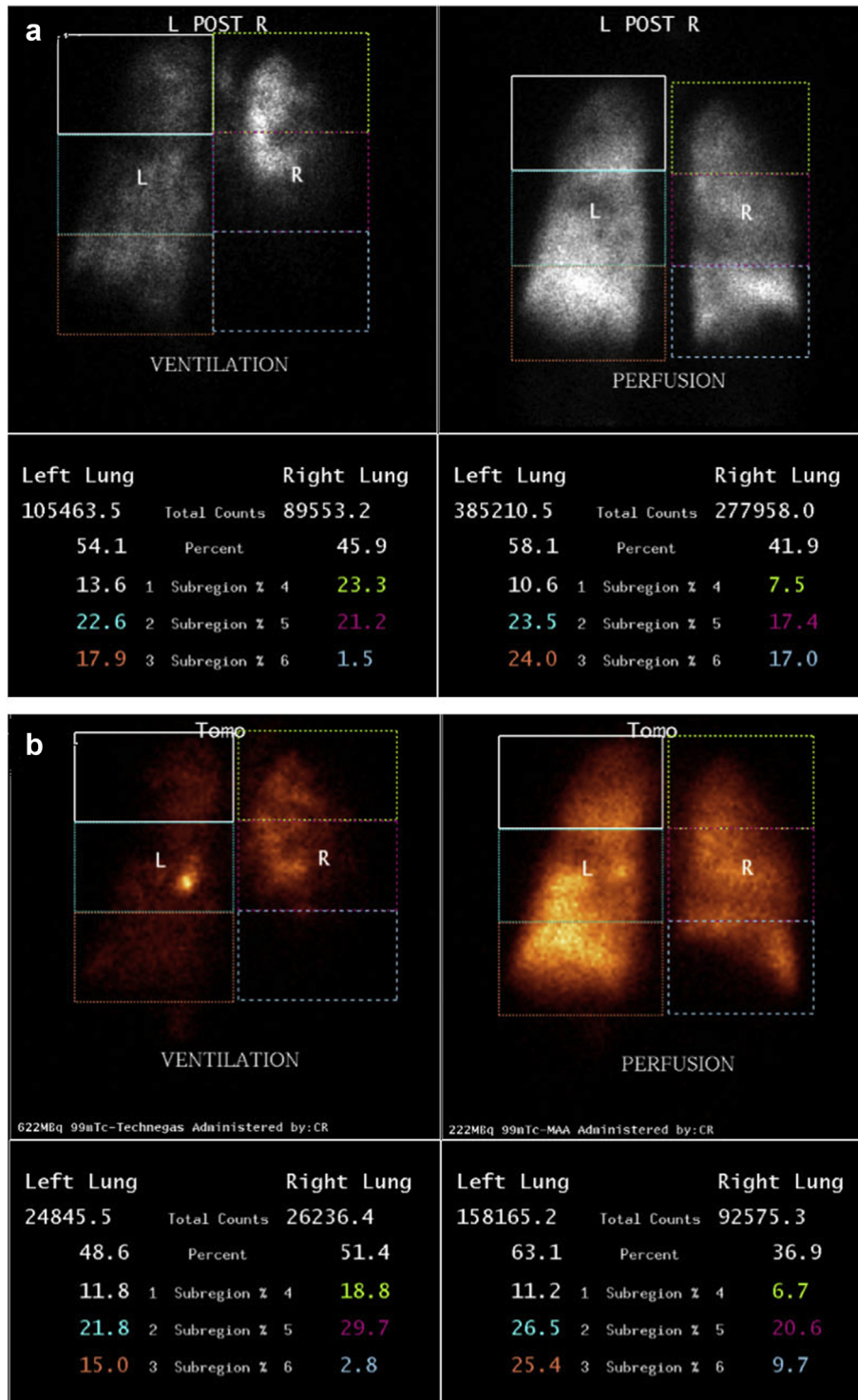


Fig. 3. VQ scan a) before and b) after procedure.

Table 1
Published cases of intrapulmonary shunting from lung cancer causing refractory hypoxia.

Authors	Age (years) Sex	Cancer	ECOG	Initial PO ₂ (mmHg)	PO ₂ after surgery	Treatment	Survival
Barlesi et al. [1] 2001	53 M	LPA	1	54 on 5L02	133 on 5L02	Surgery + Chemo	3 months
	54 F	LPA	1	53 on 5L02	125 on 5L 02	Surgery + Chemo	12 months
	68 M	LPA	2	46 on 5L02	102 on 5L02	Surgery	21 days MI complicating pneumonia
	46 M	LPA	2	49 on 5L 02	240 on 5L 02	Surgery + chemo	18 months
	(7 other cases at institution)						
Chetty et al. [2] 1997	71 M	LPA		46 on RA	63 on RA	Surgery + XRT	6 months from stroke
Falcoz et al. [3] 2009	68 M	LPA		45 on RA	72 on RA	Surgery + Chemo	24 months
	54 M	LPA		57 on RA	75 on RA	Surgery + subsequent Lung transplant	16 months later, post op after lung transplantation due to colon perforation
	63 M	LPA		55 on 15L 02	109 on RA	Neoadjuvant chemo then surgery	Alive 6 months after surgery
Fishman et al. [4] 1974	64 M	LPA		21 on RA	55 to 68 on RA	Surgery	8 months
Sarlin et al. [5] 1980	68 M	LPA		58 on RA	80 on RA	Surgery	Alive 7 months later
Vanoyan et al. [6] 1998		LPA					
Venkata et al. [7] 2009	74 M	LPA		49 on 2L02 and 52 on 100%O ₂			Ventilator support withdrawn after 30 days
Wartski et al. [8] 1998	68 M	SCC		47 on RA 84.7 on 100%O ₂	79.5 on RA	XRT	Alive 1 year later
Kikano et al. [9] 1994		? Proximal bronchial cancer		52		Surgery	
Hussain et al. [10] 1994	36 M	Carcinoid		6.14 kPa on RA (46 mmHg)		Chemo	Alive 1 year later
Lee et al. [11] 1999	37 F	carcinoid		46 on RA 71 on 100%O ₂			

M = male, F = female, LPA = lepidic predominant adenocarcinoma (formerly known as bronchioalveolar adenocarcinoma), SCC = squamous cell carcinoma. ECOG = Eastern Cooperative Oncology Group Performance Status, RA = room air, O₂ = oxygen, Chemo = chemotherapy, XRT = radiation therapy, MI = myocardial infarction.

discounted. Compared with major palliative thoracic surgical resection, intravascular stenting is less invasive and should be associated with shorter hospital stays.

Although life expectancy is unlikely to change, this procedure may also have a role as bridging therapy while awaiting more definitive treatment for selected cases with minimal disease.

3. Conclusion

This is a novel, minimally invasive approach to lung adenocarcinoma with lepidic pattern with refractory hypoxia from intrapulmonary shunting for symptom relief. Given the rarity of this condition, further studies with multi-centre collaboration are needed.

Conflicts of interest

Joanne Tan – none declared.
Darren Walters - none declared.
Karl Poon – none declared.
Paul Zimmerman – none declared.
Pat Aldons – none declared.

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