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Hereditary Hemorrhagic Telangiectasia with Atypical Pulmonary Arteriovenous Malformation during Advanced Pregnancy - A Case Report

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Case Study

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ABSTRACT

We described a case of a new, atypical pulmonary arteriovenous malformation (AVM) during advanced pregnancy, in a previously well screened woman with known hereditary hemorrhagic telangiectasia (HHT) and a remote history of pulmonary AVM embolization. A 29-year old woman, gravida 3, para 2, at 35 weeks' gestation was admitted following a first episode of massive hemoptysis. Pulmonary angiography confirmed newly dilated venous aneurysm proximal to the previous embolization material, and with marked arteriovenous shunting. The feeding artery was selected and embolized. An uncomplicated vaginal delivery ensued, and an AVM involution was noted at 3 months' postpartum.

INTRODUCTION

Hereditary hemorrhagic telangiectasia (HHT) is a relatively common autosomal dominant disorder with a prevalence of approximately one in 5,000. Over 600 different HHT-related mutations have been described, the majority of which involve either the Endoglin or Activin receptor-like kinase 1 genes. In addition to the clinical manifestations of recurrent epistaxis, gastrointestinal bleeding and mucocutaneous telangiectasias, arteriovenous malformations (AVMs) are commonly found in the pulmonary, cerebral and hepatic circulations [1-3].

Pulmonary AVMs represent abnormal communication between the pulmonary arterial and venous circulation which result in a right-to-left shunt. Pre-pregnancy screening for pulmonary AVMs is recommended. Should pulmonary AVMs be left untreated, pregnant women are at increased risk of life-threatening hemorrhage and neurological sequelae due to paradoxical embolism [4,5]. These complications typically occur in previously unscreened women in the second half of pregnancy, and are likely due to the physiological hemodynamic changes of pregnancy that reach their peak at that time [6,7]. When indicated, the mainstay of therapy is targeted embolization by pulmonary angiography [8].

In this report, we present a challenging case of an atypical re-perfusion of a pulmonary AVM during advanced gestation, in a previously well screened pregnant woman with known HHT and a remote history of pulmonary AVM embolization. The Institutional Review Board did not require approval for this type of report.

CASE DESCRIPTION

A 29 year old woman, gravida 3, para 2, at 35 weeks' gestation was admitted in a stable condition to our intensive care unit following a first episode of massive hemoptysis during the current pregnancy.

The medical history was significant for definite HHT which had been monitored for several years at our hospital's HHT

Centre. Apart from past embolization of pulmonary AVM in the right lower lobe at the age of thirteen, her disease manifestations included recurrent spontaneous epistaxis and mucocutaneous telangiectasias. Previous obstetric history was relevant for two uncomplicated term spontaneous vaginal deliveries to healthy children.

Pre-pregnancy cerebral and hepatic vascular malformation screening has been negative, and prior chest CT showed no re-perfusion or new pulmonary AVMs **(Figure 1)**.

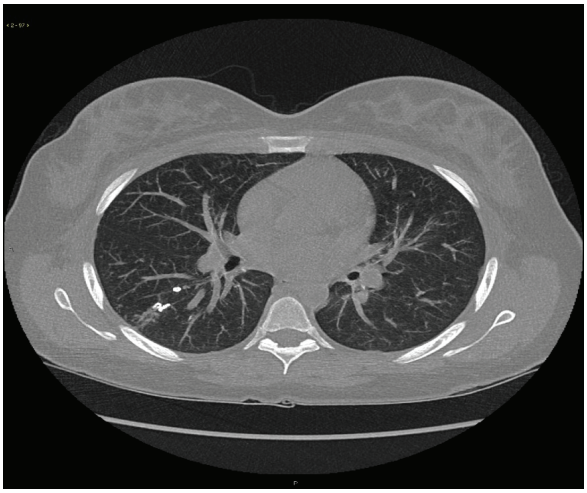

Figure 1. Pre-pregnancy chest CT showed no evidence of re-perfusion of the previously embolized right lower lobe AVM or new pulmonary AVMs.

Early pregnancy assessment, as per our HHT Centre pregnancy protocol [7], demonstrated a stable degree (grade 2) of intrapulmonary shunting on transthoracic contrast echocardiography, normal A-a gradient on room air, mild physiological respiratory alkalosis, hemoglobin of 134 g/L and normal iron studies.

At 25 weeks' gestation follow-up in the HHT Centre, she reported only minor hemoptysis, which was felt to be due to posterior epistaxis. Her transthoracic contrast echocardiogram however showed worsening intrapulmonary shunt (progressing from grade 2 to grade 3, as per previously reported grading system) and she also had a mildly elevated A-a gradient (16 mm Hg), which raised a clinical concern. Subsequent repeat non-contrast chest CT did raise the suspicion of reperfusion of one of the right-sided pulmonary AVMs that had been previously embolized **(Figure 2a)**, however, no intervention required due to negative pulmonary angiography **(Figure 2b)**.

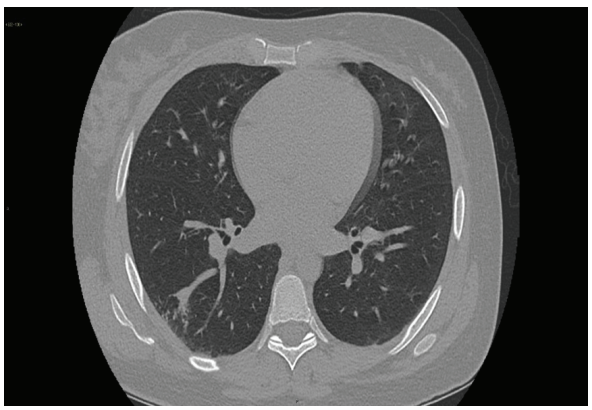

Figure 2a. 25 weeks' gestation. Chest CT showed prominent vein and aneurysmal component.

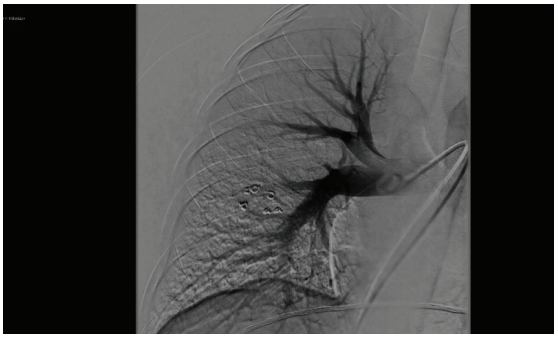

Figure 2b. 25 weeks' gestation. Pulmonary angiography showed no aneurysm and no evidence of shunting.

On admission, the patient reported sudden hemoptysis of approximately 500 cc. Maternal vital signs revealed blood pressure of 105/66 mmHg, heart rate of 84 bpm and oxygen saturation of 98% on room air. Laboratory analysis was unremarkable, including hemoglobin level of 138 g/L. Bed side fetal sonographic assessment confirmed the presence of an appropriately grown singleton fetus, cephalic presentation and a reassuring biophysical profile of 8/8. Assessment while in the intensive care unit included the following; negative bronchoscopy with no evidence of endobronchial vascular lesions, and non-contrast chest CT followed by selected pulmonary angiography. **Figures 3a-3c** did not demonstrate typical re-perfusion but demonstrated communication of the feeding artery, proximal to the previous embolization material, with a newly dilated venous aneurysm, with marked arteriovenous shunting.

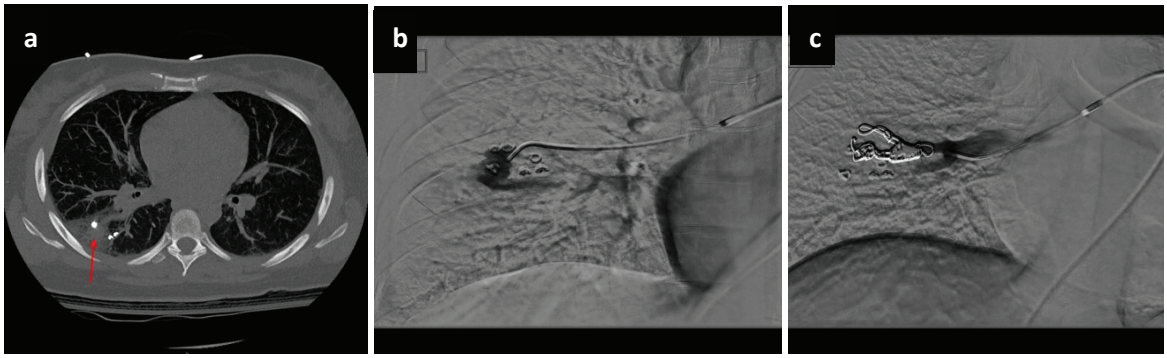

Figure 3. 35 weeks' gestation. (a) Chest CT showed a soft tissue nodule (aneurysm) and parenchymal hemorrhage (red arrow). (b, c) Pulmonary angiography showed the embolization procedure with the catheter in the feeding artery demonstrating the aneurysm followed by the coils after embolization.

The feeding artery was selected and then successfully embolized using multiple detachable coils followed by a Nester coil. A follow-up angiographic procedure several days later confirmed no perfusion through the coils and the patient remained hemodynamically stable. Nevertheless, due to concern of re-bleeding in later gestation, a decision was made to induce labor at 37 weeks' gestation. An uncomplicated vaginal delivery ensued without the need for regional anesthesia. A female infant was delivered weighing 2,880 g with Apgar scores of 7 and 9 at one and five minutes, respectively. The infant's genetic testing was positive for the familial mutation of HHT, though she has had not any signs or symptoms of HHT yet. At 3 month's post-embolization follow-up, the maternal non-contrast CT chest showed involution of the pulmonary AVM aneurysm, as would be expected in a routine successful embolization. Future follow-up is expected at 1 year post-embolization, as per clinic protocol [7].

DISCUSSION

The optimal follow-up in patients with treated pulmonary AVMs should be a combination of periodical clinical assessment, physiologic testing and chest CT imaging, generally every three to five years and sooner prior to pregnancy or with recurrent clinical manifestations [8,9]. Contrast echocardiography is generally not recommended routinely during the follow-up as it remains positive in the majority of patients, reflecting undetectable residual pulmonary AVMs by pulmonary angiography [10], though it has been included in our center's routine follow-up during pregnancy, given its non-invasive nature. We consider intrapulmonary shunt progression, as seen in our case, an indication of possible reperfusion and therefore an indication for further work-up. In a case series of 484 pregnancies in 199 women, Shovlin et al. described 1.4% risk of pulmonary hemorrhage, 1.2% of stroke and 1% of maternal death. Similar findings were reported by de Gussem et al. in a series of 244 pregnancies in 87 women with HHT. Both are in agreement that unscreened and/or untreated women prior to pregnancy represent the highest risk group for complications during pregnancy [6,7]. The mechanisms of persistent pulmonary AVMs after embolotherapy include; re-canalization through previously placed coils, re-perfusion via adjacent pulmonary arteries, and re-perfusion of formerly unrecognized, too small, feeder arteries that may grow over time. These new pulmonary AVMs are typically recognized in close proximity, or more commonly, distal to the previously embolized AVM [11]. Therefore, the present case is quite intriguing from several aspects; firstly, it demonstrated communication of the feeding artery, proximal to the previous embolization material, with a newly dilated venous aneurysm, with marked arteriovenous shunting that had emerged during pregnancy. The lack of any AVM maturation over 17 years of follow-up in this patient, including normal pre-pregnancy screening, makes growth and re-perfusion of a previously unrecognized feeder artery unlikely. Secondly, the unusual location of the aneurysm, proximal rather than distal to the previous coiling, further supports the formation of a new pulmonary AVM structure. One plausible hypothesis is that the new AVM had developed over a weakened proximal pulmonary segment that was further exacerbated by the pregnancy hyperdynamic state, despite the years that had elapsed from the primary treatment. A mycotic aneurysm could be an alternative aetiology but all investigations disproved it.

The management of persistent pulmonary AVMs during pregnancy should be similar to that in the non-pregnant state with safety optimization by minimizing the field of radiation and fluoroscopy time. However, based on a small case series from non-pregnant populations, the success rate for repeat embolotherapy varies between 75-85% and is mainly dependent on the underlying complexity of the aneurysm, with the re-canalization type offering a higher success rate [9,11,12]. We could not locate any

past experience with repeated pulmonary AVM embolization during pregnancy. However, we felt that the risk of life-threatening pulmonary hemorrhage was greater without embolization than the theoretical risks with embolization. In spite of the favorable outcome in our case, theoretically, an embolotherapy of this new pulmonary AVM just proximal to the previously treated AVM could have compromised the stability of the old coiled AVM, and potentially jeopardized fetal and maternal well-being, especially in the late third trimester. As such, we also believe that consent for an emergency cesarean section should be obtained on admission and prior to pulmonary angiography in case of a life-threatening event.

CONCLUSION

In conclusion, we have described a newly formed pulmonary AVM in an atypical location in a symptomatic woman during advanced pregnancy. We are in agreement with previous reports that successful management requires adequate pre-pregnancy screening and close monitoring during pregnancy in order to enhance diagnosis and to expedite embolotherapy. Comprehensive multidisciplinary collaboration between interventional radiologists, HHT and maternal-fetal-medicine specialists are essential to optimize fetal and maternal outcomes. Physicians should be aware that pulmonary AVMs re-perfusion may present differently than would be expected based on non-pregnancy experience. Future studies should report their experience with repeat embolotherapy during pregnancy.

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