some mononuclear inflammatory cells. In contrast to the granulomas of tuberculosis or sarcoidosis, which tend to be confluent, the varicella nodules are always isolated. They are scattered throughout the lungs, although they may be more dense at the base than at the apex of the lungs. Both calcified and noncalcified lesions can be found in the same patient. Calcification progresses over a period of many years and is usually not noted on chest roentgenograms earlier than two years after the acute illness.4 In our patient we found granulomas consistent with focal parenchymal necrosis possibly secondary to an acute necrotizing vasculitis in the past. The granulomas are consistent with the nodules described as persistent lesions after varicella pneumonia.

We conclude that the history, clinical findings, chest roentgenograms and biopsy findings in this patient are consistent with a pulmonary granulomatous lesion as a sequela of varicella pneumonia. While the acute lesion of varicella pneumonia and the late pulmonary calcifications are well known, the histologic features of the lesion in the intermediate state so far have not been described.

REFERENCES


Hereditary Telangectasia and Multiple Pulmonary Arteriovenous Fistulas*

Clinical Deterioration during Pregnancy

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We describe the effect of pregnancy on a woman with multiple pulmonary arteriovenous fistula. Pregnancy was terminated at 35 weeks' gestation because of severe hypoxemia. During the early postpartum period, the intrapulmonary shunt fraction enlarged, and hypoxemia worsened, necessitating emergency resection of the A-V fistula. Pregnancy may increase the intrapulmonary shunt fraction in patients with multiple pulmonary arteriovenous fistula through its effect on plasma volume and produce life-threatening hypoxemia near term or in the early postpartum period.

Although over 200 cases of hereditary telangectasia and pulmonary arteriovenous (A-V) fistulae have been described, the effect of full-term pregnancy on a patient with pulmonary A-V fistula has not been reported. We describe a patient with multiple A-V fistulae who developed life-threatening hypoxemia as a consequence of a 35-week pregnancy.

CASE REPORT

At the age of 21, during the seventh month of pregnancy, the patient presented with symptoms of progressive fatigue, dyspnea and cyanosis. She had been an active child and at the age of 16, right lower lobe A-V fistula was discovered incidentally on a chest x-ray film. She underwent right lower lobectomy. Since her brother and father had multiple cutaneous A-V fistulae, the diagnosis of hereditary telangectasia was made. At age 19, she was hospitalized for symptoms of fatigue and lightheadedness. A PaO2 of 46 mm Hg was measured with the patient breathing room air. A large fistula was removed by right middle lobectomy. Her exercise tolerance improved after surgery. She was able to jog daily, and worked as a clerk and housewife until the third month of pregnancy when symptoms of fatigue and dyspnea recurred and progressed. At 31 weeks' gestation, she was hospitalized and placed on bed rest. Physical examination revealed cyanosis and tachypnea at rest. Her respiratory rate slowed from 28 to 20 as she moved from the sitting to supine posture. Blood pressure was 100/70 mm Hg and pulse rate was 110. Multiple small telangectasias of the nailbeds and oral mucosa were present. A bruise was noted above the left lower lobe, and a gravid uterus was evident and easily palpable. There was no edema. Her shunt fraction, measured while breathing 100 percent oxygen, was 38 percent in the supine posture and 49 percent in the sitting position (Table 1). Because of the severity of her hypoxemia, a C-section was performed at 35 weeks' gestation, and a healthy infant was delivered. During the postpartum period, she became more breathless, and her sitting shunt fraction increased to 57 percent 14 days postpartum. She was unable to stand without feeling faint, as her PaO2 fell to 23 mm Hg in the standing position. Pulmonary angiogram showed multiple bilateral pulmonary A-V fistulae (Fig 1). On the 19th postpartum day, bilateral pulmonary wedge resections using the TA-90 and TA-55 staple devices (United States Surgical Corporation, Stamford, CT) were performed. Resection lines were determined by intraoperative

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concentrate or by smaller supine lung volumes decreasing the shunt fraction. An alternative explanation may be the fall in mixed venous oxygen tension that occurs normally when an individual changes from the recumbent to the sitting position. Since the mixed venous O₂ content was estimated and not measured directly, this fall in mixed venous O₂ content would be calculated as an apparent increase in the shunt fraction. Since delivery of the infant removed the pressure effects of the gravid uterus on the base of the lung, it was not surprising that there was an increase in the shunt fraction and hypoxemia postpartum. The shunt increase persisted for two weeks, although the blood volume returns to near normal seven days postpartum. This suggested that during pregnancy, either new A-V fistulas developed or permanent enlargement of existing fistulas occurred.

Although surgical stapling devices have been in use in this country since 1966, there is only one detailed description of their use in treating multiple pulmonary A-V fistulas. Since the fistulas were near the periphery of the lung, we were able to limit the resection of functioning lung tissue using this technique, as evidenced by only a 415 ml fall in vital capacity.

The life-threatening progression of hypoxemia in this patient indicates that tubal ligation to prevent pregnancy, or therapeutic abortion in the event of pregnancy, should be strongly considered in any patient with multiple pulmonary A-V fistulas and a significant shunt fraction. If full-term pregnancy occurs in such a patient, the postpartum increase in shunt fraction and hypoxemia may necessitate emergency life-saving attempts to either resect or occlude the pulmonary A-V fistula.

**REFERENCES**

5 Pritchard JA. Changes in the blood volume during pregnancy and delivery. Anaesthesia 1965; 26:393-99

**Table 1—Arterial PaO₂, Shunt Fraction and Vital Capacity Measurements during Pregnancy, Post-Partum and Post-Wedge Resection**

| Time of Test           | PaO₂ | Shunt Fraction | FVC n/|%Pred |
|------------------------|------|----------------|-----------|
| Supine                 |      |                |           |
| 31 weeks gestation     | 48   | 45             | 38        |
| 2 weeks postpartum     | 39   | 31             | 23        |
| 1 hour post-wedge resection | 56   | 29             | 28        |
| 12 months post-wedge resection | 53   | 23             | 2,750/71  |
| 37 months post-wedge resection | 56   | 29             | 2,335/63  |

*Hereditary Telangiectasia (Swinburne et al)*