CATHETER PERFORATION OF PULMONARY ARTERY

Table 1—X-ray Appearance of Pulmonary Blastoma.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Location</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R midlung</td>
<td>Circumscribed, homogeneous</td>
</tr>
<tr>
<td>2</td>
<td>Bilateral</td>
<td>Well-demarcated nodules</td>
</tr>
<tr>
<td>3</td>
<td>L U L</td>
<td>Nodular</td>
</tr>
<tr>
<td>4</td>
<td>R U L</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>5</td>
<td>R U L</td>
<td>Well-demarcated, homogeneous</td>
</tr>
<tr>
<td>6</td>
<td>Sup seg, LLL</td>
<td>Well-circumscribed</td>
</tr>
<tr>
<td>7</td>
<td>Ant seg, LUL</td>
<td>Cavitating</td>
</tr>
<tr>
<td>8</td>
<td>L U L</td>
<td>Sharply demarcated, lobulated, homogeneous mass</td>
</tr>
<tr>
<td>9</td>
<td>L U L</td>
<td>Well-demarcated, homogeneous</td>
</tr>
<tr>
<td>10</td>
<td>Sup Seg, LLL</td>
<td>Hard, oval mass, circumscribed</td>
</tr>
<tr>
<td></td>
<td>R U L</td>
<td>Clearly demarcated, oval</td>
</tr>
<tr>
<td>11</td>
<td>LUL, Lingula</td>
<td>LUL</td>
</tr>
<tr>
<td></td>
<td>L U L</td>
<td>Well-demarcated</td>
</tr>
</tbody>
</table>

Bronchial washings were negative for fungi or malignant cells. Bronchography demonstrated stenosis of the left lower lobe bronchus with obstruction of the superior segment of the lower lobe.

A left lateral thoracotomy revealed an irresectable tumor involving the hilum, pleura, and adjacent chest wall. Postoperatively, the patient developed respiratory distress with sepsis and died two weeks following surgery.

Pathologic description revealed the tumor to be in the superior portion of the left lower lobe, measuring 6 x 8 x 4 cm and extending to the hilum and its bronchi. The mass was soft yellow-brown, with areas of necrosis and hemorrhage into its substance. Microscopically, the tumor consisted of malignant stroma and malignant glands.

ROENTGEN MANIFESTATIONS

In reviewing previously reported cases, a roentgen pattern of the tumor is well demonstrated. A composite of the cases reported (Table 1) shows a well-demarcated peripheral lesion which may be somewhat lobulated. There is occasional cavitating,1 and the lesions vary in size. Although there is no statistical significance, the lesions have been found more commonly on the left. Pulmonary blastomas occur both in men and women and are indolent, with survival times recorded which vary from two to fifteen years.5 Although the case reports do not present sufficient information, pleural effusion was not present in the case reported by Dr. Cox or in the presently reported case. From the pathologic reports it appears that the well-demarcated lesions are "encapsulated" by compressed or atelectatic lung tissue.10, 5

Differential diagnoses include hydatid pulmonary cysts, carcinosarcomas, bronchial adenomata, bronchogenic carcinomas, and metastatic tumors.

CONCLUSION

A 20th case of pulmonary blastoma is reported. Roentgen manifestations indicate that this is a well-demarcated lesion seen in the periphery of the lung. There is a tendency to occasional lobulation and cavitation. The lesions vary in size and tend to be indolent pathologically.

CATHETER PERFORATION OF THE PULMONARY ARTERY WITH RESULTANT CARDIAC TAMPODANE

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A case of pulmonary artery perforation secondary to direct penetration of a NIH catheter at the time of pulmonary angiography is described. The patient immediately went into cardiac tamponade, which was successfully treated via pericardiocentesis without subsequent surgical intervention.

Perforation of the pulmonary artery secondary to right heart catheterization has not been reported thus far in the American literature. Teramoto1 describes puncture of the pulmonary artery as a complication of septalcardiac catheterization with the use of the method described by Ross.

Davidson and colleagues,2 in 80 pulmonary artery injections with the use of catheters with closed tip and side openings, describes one instance of a small subintimal deposit of contrast in the pulmonary artery without effect.

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References

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Case Report

The patient was a 38-year-old white married woman admitted to Cedars of Lebanon Hospital on September 14, 1970, because of the onset of right flank pain. Subsequent work-up revealed an extensive right-sided retroperitoneal mass which at exploratory laparotomy was found to be an undifferentiated lymphosarcoma.

The postoperative course was satisfactory until the fourth postoperative day when there was a sudden syncopal episode. This episode was preceded by left-sided pleuritic chest pain. At this time, there was marked elevation of the cervical venous pressure. The veins were distended and failed to empty on expiration. Moderate pulsus paradoxus was observed. The chest x-ray film examination when compared to the preoperative films showed that the transverse diameter of the cardiac silhouette had increased by 2.5 cm although the lung fields remained clear. The patient was felt to have developed a pericardial effusion most likely secondary to the underlying lymphosarcoma. A lung scan done at this time also suggests the possibility of a left-sided pulmonary embolus. In an effort to clarify the clinical picture, right heart catheterization and pulmonary angiogram were done. The catheter was placed with its tip in the region of the pulmonary artery. The sweep of the catheter outlined the right atrial wall which was separated from the outer cardiac margin by a distance of 3 cm, and thus confirmed the presence of pericardial effusion. The pulmonary artery pressure was 26/15. The right ventricular pressure was 27/3.16. The right atrial pressure was 16/10. The pulse contour in the right atrium and right ventricle was considered typical of myocardial restriction, such as is observed in cardiac tamponade.

Pulmonary angiography was then performed via an antecubital vein cutdown. A No. 7 F 125 cm NIH catheter with four side-holes and no end-holes was used. This catheter was introduced under fluoroscopic control with continuous pressure monitoring.

It was noted that the catheter tip appeared to be in a good position in the main pulmonary artery. Advancement into the right pulmonary artery, however, did meet with some resistance. Because of this, 10 ml of 75 percent diatrizoate (Hypaque M) was introduced via hand injection and normal spread of the contrast medium throughout the pulmonary tree was demonstrated. Blood was freely aspirated through the catheter. At this point, 40 ml of 75 percent diatrizoate was injected using a Cordis pressure injector employed at a pressure setting of 400 pounds per square inch. The pressure injection took place over an interval of two seconds with serial films obtained at a rate of two frames per second. These revealed perforation of the main pulmonary artery with extravasation of the contrast medium superiorly into the mediastinum (Fig 1). The contrast medium filled the entire pericardial sac and was promptly diluted by the preexisting fluid. Following injection of the contrast medium, the patient rapidly became hypotensive, diaphoretic and nauseated. An immediate pericardiocentesis, using an 18 gauge Teflon catheter needle inserted via the subxiphoid approach was performed; 250 ml of bloody fluid with a hematocrit of 13 vol percent was removed. There was a prompt return to normotensive levels with the blood pressure rising from 80 mm Hg systolic to 130 mm Hg systolic. The Teflon catheter was sealed with its obturator and fixed in position with a No. 00 silk skin suture. The patient was returned to the intensive care unit for further monitoring and observation. Approximately three hours after the procedure her blood pressure declined again, this time to a level of 90 mm Hg systolic. Repeat pericardiocentesis through the previously placed needle produced 150 ml of bloody fluid, this time with a hematocrit of 24 vol percent. Following the second pericardiocentesis, there were no further episodes of hypotension and the Teflon catheter needle was removed approximately 24 hours after its insertion.

On the day following the pulmonary angiogram, chemotherapy was begun using a triple regimen of cyclophosphamide (Cytoxan), vincristine and prednisone.

By October 10, 1970, pelvic examination showed almost complete disappearance of the pelvic extension of the retroperitoneal mass. There was no gross clinical recurrence of pericardial effusion. Following this, however, the patient underwent a rapid downhill course and died on December 12, 1970. At autopsy, there was diffuse organ involvement with lymphosarcoma. Although there was involvement of the pericardial sac and epicardium, no involvement of the pulmonary artery was noted.

Discussion

It is felt that the perforation was entirely due to catheter penetration rather than the "jet-effect" described by Doumanian and Amplatz. Ordinarily, effective injection pressures in excess of 800 pounds per square inch coupled with single end-hole catheters are required to produce a jet with force sufficient to cause vascular damage.

In our case, a false sense of security was achieved by the free passage of contrast media and by easy aspiration of blood. It is to be noted, however, that with side-hole catheters it is possible to penetrate the myocardium or the endothelium of the great vessels for a distance as great as 1 cm with normal blood pressures and blood sampling still obtained through the nonoccluded proximal side orifices. Test doses of opaque media injected at
relatively low pressures may fail to demonstrate the occurrence of such accidents. With hand injection under relatively low pressures, the contrast medium flows selectively through the more proximal orifices which are intraluminal. The tissue pressure during the hand injection is adequate to plug the distal holes so that the test injection shows no extravasation.

The NIH catheter is preferred to the Courmand catheter for angiographic work because it has a thinner wall and greater luminal diameter than a Courmand of the same French size, a closed tip and four spirally arranged side-holes, 1 to 2 cm proximal to the tip which permit discharge of the opaque medium in a manner that minimizes recoil of the catheter. The combination of a larger internal diameter and multiple side-holes permit discharge of the opaque medium over a wider area more rapidly than would injection through a single end-hole Courmand catheter.

The difference in tip configuration between the NIH catheter and the Courmand catheter produces essentially no difference in the ability of these catheters to penetrate tissue. The major factor governing perforation of tissue by catheters appears to be the stiffness of the catheter material. Stiffness varies with the caliber and is inversely related to the degree of hydration of the catheter. The latter factor is markedly affected by the method of sterilization. Studies have shown that methods of sterilization which lead to dehydration of the catheter (dry heat, autoclaving with a vacuum drying cycle, and sterilization by ethylene oxide with a prolonged vacuum-gas evacuation cycle) lead to marked increases in catheter stiffness. Conversely, methods of sterilization that hydrate the catheter (boiling, cold sterilization in liquid germicides, autoclaving without a vacuum drying cycle) tend to markedly decrease the stiffness of the catheter, sometimes to the point where it cannot be effectively manipulated.

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REFERENCES


Pulmonary Varicosity Associated with Other Congenital Abnormalities*

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Varices of the pulmonary veins are rare. Only 29 cases have been reported up to now. We present another case of a pulmonary varix of the right lung associated with absence of the superior pulmonary vein, hypoplasia of the descending branch of the right pulmonary artery, congenital bronchiectasis of the middle and lower lobes, and incontinence of the right diaphragm. A brief review of the literature is given. Because pulmonary varices radiologically resemble mediastinal or pulmonary lesions, angiocardiography is indicated to avoid exploratory thoracotomies.

Varices of the pulmonary veins are rare and in most cases clinically insignificant. Their importance lies in the radiologic appearance and their resemblance to coin lesion, pulmonary tuberculosis, bronchogenic carcinoma, mediastinal tumor, mediastinal lymphadenopathy and arteriovenous fistula. The recognition of pulmonary varices by angiocardiography is important if unnecessary exploratory thoracotomies are to be avoided.

The first case of a pulmonary varix was described by Puchet1 in 1843 as an incidental finding at necropsy in a newborn baby who died from intestinal hemorrhage and who presented multiple varices in other organs as well. Mougin and associates2 in 1951 and Gottesman and Weinstein3 in 1959 demonstrated pulmonary varices in living persons for the first time by angiocardiography. Twenty nine cases, discovered at necropsy or proved by angiocardiography have been reported to date and of those only one patient4 was operated upon.

We report another rather unusual case of a varicosity of the right upper lobe associated with absence of the superior pulmonary vein, hypoplasia of the descending branch of the right pulmonary artery, congenital bronchiectasis of the middle and lower lobes and evention of the right diaphragm.

CASE REPORT

A 39-year-old man was admitted to the hospital because of recent severe hemoptysis. He had a history of three other severe hemoptyses in the last two years. He had no other symptoms and reported that, besides the hemoptyses, he had always been healthy and working. His chest x-ray film presented a pseudocavity with thick wall at the base of the right lung and an evention of the right diaphragm (Fig 1). On the basis of tomography a diagnosis of an arteriovenous fistula was suspected and angiocardiography was carried out. The results of catheterization of the right heart chamber and pulmonary artery showed normal findings. Angiocardiography which followed demonstrated hypoplasia of the pulmonary veins.