

**DISCUSSION**

Although the roentgenographic changes due to pulmonary sarcoidosis may resolve completely in a large percentage of cases, probably 20 percent will ultimately develop widespread fibrosis with eventual distortion of the lung architecture. This distortion is caused by a gradual upward migration of parenchymal lesions over a period of years, which results in dense fibrosis with upward retraction of the hilum. Coarse, irregular strands commonly extend from the hilum toward the periphery.

The presence of a mass lesion simulating bronchogenic carcinoma is an unusual finding, and was not mentioned in a series of 1,254 patients with proven sarcoidosis, 94 percent of whom had abnormal chest roentgenograms. On reviewing the literature we could find only four cases similar to ours. Hahn's patient was found to have multiple hard, dense nodules which resulted in a "frozen hilus." Multiple biopsies of the lung, hilar mass, and pleural implants were suggestive of sarcoidosis. Resectional surgery was deemed inadvisable, and the patient remained well for 11 years after operation without further specific therapy.

Sarcoidosis commonly causes symptoms which are also usually associated with bronchogenic carcinoma, including fatigue, malaise, weight loss, cough, dyspnea, chest pain, and occasionally hemoptysis. When these are combined with suspicious chest roentgenograms, planigrams, bronchoscopic findings, and bronchograms, the clinical suspicion of carcinoma is even stronger. Since bronchogenic carcinoma has been reported to co-exist with sarcoidosis, even if the diagnosis of sarcoidosis has been firmly established previously, diagnostic thoracotomy will be required to rule out co-existent carcinoma.

The finding of bronchial stenoses in our patient contributed further to the suspicion of carcinoma. Three different types of bronchial involvement have been described in sarcoidosis. The first is caused by enlarged hilar nodes which compress the major bronchi and which may result in collapse or eventual bronchiectasis. This is quite rare, in spite of frequent massive enlargement of the mediastinal nodes. The second type is the occurrence of sarcoiid lesions in the bronchial wall. This type is not unusual and diagnosis can frequently be made by means of bronchoscopic biopsy. The third type is the diffuse bronchial constriction which occurs in the later stages of fibrosis and results in narrowing of the major bronchi. Longcope and Freiman suggest that this is not infrequent.

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**A Technique for Unknotting an Intracardiac Flow-Directed Balloon Catheter**


Described is an unusual complication occurring during right-sided cardiac catheterization using a 7F flow-directed balloon catheter. During an attempt to direct the catheter from the main pulmonary artery into the pulmonary wedge position, the tip became entangled in a loop of catheter and knotted. Initially, all attempts to unknot or remove the catheter failed. A movable-core guide wire was passed through the major lumen of the catheter, resulting in the immediate unknotting of the catheter, thus allowing its withdrawal.

**REFERENCES**

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**UNKNOTTING INTRACARDIAC FLOW-DIRECTED BALLOON CATHETER 731**
In recent years the flow-directed balloon-tipped catheter has become an important instrument in the assessment of cardiac hemodynamics.\(^1,2\)

Knotting of these catheters is very unusual,\(^3\) and the described method of withdrawal with the knot intact cannot be performed with the newer larger diameter catheters.\(^4\)

We describe here a potentially severe complication occurring with a 7F flow-directed nonthermodilution catheter, that was averted when the catheter was easily unknotted, using a movable core guide wire.

**Case Report**

A 45 year old woman with aortic regurgitation of unknown etiology underwent cardiac catheterization prior to consideration for aortic valve replacement. A 7F Swan-Ganz non-thermodilution flow-directed balloon catheter was inserted into the right basilic vein from a right antecubital fossa cutdown. The balloon was inflated in the superior vena cava and the catheter directed without difficulty through what appeared to be a normal-sized right atrium and right ventricle and entered the proximal part of the main pulmonary artery. However, the catheter would not progress beyond this position and a partial loop with a large diameter then developed in the right atrium and right ventricle. At this point, the tip of the catheter slipped back into the right ventricular outflow tract. With the intention of pulling the catheter back to the right atrium, the balloon was deflated and the catheter withdrawn. Following withdrawal of the catheter into the right atrium, it was noted that a large loose complete knot had formed about 10 cm from the tip. The catheter was manipulated into numerous positions both in the right atrium and right ventricle, but it could not be unknotted.

The catheter was then withdrawn, resulting in tightening of the knot. Because of the large diameter and stiffness of the catheter, the knot remained much larger than the diameter of the peripheral veins and could not be completely withdrawn. A USCI 0.038 inch (0.97 mm) movable-core guide wire was then directed along the major lumen of the catheter, with about 6 cm of the inner core withdrawn from the guide wire tip. As the floppy tip of the guide wire approached the knot, it loosened. It was intended that the adjustable inner core be used to stiffen the distal part of the guide wire and so further loosen the knot. However, before the inner core could be manipulated, the catheter unknotted and was removed from the vein. The right heart catheter was replaced and the cardiac catheterization proceeded uneventfully.

**Discussion**

Intracardiac knotting of catheters, although reportedly uncommon, does represent an important complication with the use of the flexible polyvinyl chloride flow-directed balloon catheters. The manufacturers of the Swan-Ganz catheter, Edwards Laboratories, stress that kinking and looping, the precursors of knotting, occur when an excessive length of catheter has been inserted. In such an event, the catheter should be carefully withdrawn to the 30 cm mark and then readvanced. In our case, the looping was recognized immediately and the recommended procedure instituted but, unfortunately, knotting still occurred. Because of the large luminal cross-sectional area of the 7F catheter (1.8 mm\(^2\))\(^6\) the catheter with knot intact could not be withdrawn from the vein, a technique recommended for the 5F catheter, by Lipp et al.\(^4\) If the catheter is inserted from the subclavian vein, withdrawal with the knot intact is also not recommended as, theoretically, it may lacerate this vein, with resultant uncontrollable hemorrhage.\(^5\)

Another method for unknotting catheters involves manipulation in the right atrium or right ventricle in order to loosen and move the knot toward and over the catheter tip. Although successful on occasion,\(^6\) it was not helpful in our case. Both local cutdown on venous channels and open cardiotomy have also been used on rare occasions to remove knotted catheters.

Although the use of a guide wire to unknot a catheter appears to be a logical maneuver, we are unaware of its description with this complication. Baldi et al.\(^5\) feel that the passage of a semiflexible guide wire through the lumen of a catheter is ineffective in complete knotting and is contraindicated because of the theoretical hazard of perforating the catheter, blood vessels or cardiac chamber. We feel, however, that provided the knot is not tight, this technique should not introduce an extra hazard to the patient.

In our case a 0.038 inch movable-core guide wire was used with minimal difficulty most of the way along the lumen of the catheter. On testing other 7F nonthermodilution Swan-Ganz catheters with this guide wire, considerable difficulty was found in its passage. However, a thinner 0.035 inch movable-core guide wire was used without difficulty to the tip of the catheter. We recommend that both sizes, or at least a 0.035 inch guide wire be available whenever a size 7F Swan-Ganz nonthermodilution catheter is used. The use of such a guide wire should obviously be performed under fluoroscopic control to prevent the possibility of perforation of catheter, blood vessels or cardiac chamber.

In conclusion, the incidence of serious complications with the use of flow-directed balloon catheters is rare in relationship to the utilization of this device.\(^6\) Nevertheless, extreme care must always be practiced and the physician must be aware of all the potential dangers, their prevention and their treatment.

**References**

Recurrent Myxosarcoma of Left Atrium


The surgical treatment of cardiac myxosarcoma is reviewed with emphasis placed on palliative response to radiation therapy. A case of primary myxosarcoma of the left atrium in a 16-year-old girl is presented. The tumor was surgically removed in October, 1967. Recurrently myxosarcoma was removed in August, 1968, at which time involvement of the pulmonary veins and the pericardium was noted. Subsequent to postoperative radiation therapy, the patient remained symptom-free for more than three years. Death occurred 4½ years after the original operation from local and systemic recurrence of the tumor.

This is a report of a patient with left atrial myxosarcoma treated by surgical and radiation therapy with a brief summary of the literature on the subject, stressing the need to combine both types of therapy.

CASE REPORT

The patient, a 16-year-old girl, was admitted with the chief complaint of marked increase in shortness of breath during late 1967.

On physical examination, she had to remain sitting upright in bed. A blowing systolic nonradiating murmur, grade 2/6, best heard at the cardiac apex, was present. The cervical veins were distended to the angle of the jaw when the patient was sitting. The liver was percussed 3 cm below the right costal margin. Thoracic roentgenograms showed pulmonary edema and a relatively small cardiac silhouette. The electrocardiogram had ST changes compatible with ischemia, myocarditis or digitalis effect.

Selective pulmonary arteriography showed an enlarged main pulmonary artery and a large filling defect, 3 by 6 cm, within the left atrium. The left ventriculogram exhibited moderate reflux of contrast medium into the left atrium with a large filling defect outlined within the atrium which at times seemed to prolapse through the mitral valve.

The patient was taken to the operating room and via a right anterolateral thoracotomy, the left atrium was found to be enlarged by a mass that pushed down the intra-atrial sump. On total cardiopulmonary bypass, the left atrium was

![Figure 1. a. Recurrent tumor nodules involving posterior aspect of the septal wall of the left atrium. Area of septal patch (P) is anterior to recurrent tumor. b. Closeup of tumor involving the posterior leaflet of the mitral valve.](http://journal.publications.chestnet.org/pdffile.axd?url=/data/journals/chest/20967/)