**CASE REPORT**

**Catheter-Based Techniques of Transvenous Intracardiac Tumor Biopsy Without Echocardiography Guidance**

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**Summary**

Transthoracic, transesophageal, and intracardiac echocardiography are applicable imaging tools used for increasing the accuracy of tumor positioning during transvenous intracardiac tumor biopsy. However, incorporating echo-images in the extremely rare procedures is usually not easy. By using a contralateral catheter for simultaneous contrast injection and tip positioning, we demonstrated tumor biopsy safely and effectively in 4 cases without the guidance of echocardiography.

**Key words:** Cardiac mass, Diagnosis, Catheterization

Intracardiac tumors generally can be categorized into intramural thrombi, primary cardiac neoplasms, and metastatic tumors. Management of intracardiac tumors is usually determined by obtaining tissue pathology directly. However, applying the biopsy probe, designed for myocardial sampling from the right ventricular septum, to intracardiac tumor biopsy has additional safety concerns due to diverse positions, contours, and sizes of the tumors. Conventionally, transthoracic (TTE), transesophageal (TEE), or intracardiac echocardiography (ICE) are applicable imaging tools for increasing the accuracy of tumor positioning. However, incorporating echo-images into the biopsy procedure is usually not easy for operators due to the relative lack of experience. Here we report a simple but effective method for intracardiac tumor biopsy without the aid of echocardiography.

**Case Report**

A 66-year-old female presented with progressive exertional dyspnea that had lasted for one month. She had sick sinus syndrome with a permanent dual-chamber pacemaker implantation. Due to multiple nodules found in chest X-rays, chest computed tomography (CT) was arranged and showed multiple lung nodules and a right atrial (RA) mass (Figure A) incidentally. Later TEE revealed one fixed and multi-lobulated tumor about 3.3 × 2.6 cm in RA. (Figure B) Transcatheter tumor biopsy was therefore recommended for determining the nature of the RA tumor.

Through the left femoral vein, angiography via a pigtail catheter was used to delineate the RA tumor (Figures C, D). Then, the tip of a 100-cm 6F Multipurpose-Angled catheter (Cordis Corporation, Miami, FL, USA) was set at the target site as the guidance for later biopsy and further contrast testing if necessary. In this way, the correct position of the 7F 98-cm sheath for advancing biopsy forceps could be established under two perpendicular views via the right femoral vein (Figures E, F). Several specimens were thereafter taken as close as possible to the tip of the Multipurpose catheter by a 104-cm 7F Bioptome (Cordis Corporation) smoothly and safely. The pathology was primary angiosarcoma with positive immunohistochemical analysis for CD31.

Another 3 cases also underwent catheter-based intracardiac tumor biopsy by the same procedure without any complications. The characteristics of the overall 4 cases are listed in the Table.

**Discussion**

Although multiple imaging tools including echocardiography, computed tomography, and cardiac magnetic resonance could provide thorough information for the clinical diagnosis of cardiac masses, obtaining tissue pathology remains the most conclusive way to differentiate benign from malignant tumors and thus to decide further management. Conventionally, echocardiography with or
without the assistance of fluoroscopic imaging has been proved to be helpful in guiding the bioptome to the target tumor. However, there are several concerns with regard to applying either kind of echocardiography to the procedure. First, manipulation of the echocardiographic probe beyond the standard views could be not optimized. Moreover, taking our case as an example, the presence of intracardiac instruments such as pacemaker leads or mechanical valve would interfere with accurate tumor detection or delineation, and thus make TTE inappropriate for guiding the procedure. The drawbacks could be overcome by the use of TEE or ICE. However, there exists a substantial gap to incorporate echocardiographic images to fluoroscopic images for such rare procedures.

In this report, we present 4 cases with intracardiac tumor biopsy that were successful using only fluoroscopic guidance. Basically, manipulating the sole bioptome to get a precise position for tumor biopsy is risky because contrast testing could not be done when the bioptome was inside the guiding sheath. Therefore, we suggest the use of a Multipurpose diagnostic catheter via the contralateral femoral vein to confirm the position for biopsy. There are several advantages. First, it is always easy for interventionists to position the tip of the catheter near the target site. Second, the catheter tip could serve as the target for the bioptome. As we observed, the tip of the guiding sheath for a bioptome would change its direction when we advanced the bioptome within it. The change is relatively acceptable during endomyocardial biopsy, but could be rather risky for intracardiac tumor biopsy. The fixed guide provided by the tip of the Multipurpose catheter could ensure that the biopsy is performed near the accurate position. Third, if further adjustment or repeated assurance of the bioptome position is necessary, contrast injection could be done through the Multipurpose catheter at any time without retrieval of the bioptome.

**Conclusion**

In this case report, we have proposed a method for performing intracardiac tumor biopsy by the aid of simultaneous contrast injection and catheter tip positioning, which is relatively simple, time-saving, and safe.

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**Table.** Characteristics of the Four Patients with Catheter-Guided Intracardiac Tumor Biopsy

| Case  | Gender (M/F) | Age (years) | Tumor location | Maximum dimension (cm) | Tumor pathology    |
|-------|--------------|-------------|----------------|------------------------|--------------------|
| 1     | F            | 66          | RA             | 3.3                    | angiosarcoma       |
| 2     | M            | 67          | RV             | 6.1                    | thrombus           |
| 3     | M            | 68          | RA, SVC        | 7.1                    | lymphoma           |
| 4     | F            | 44          | RA, LA         | 7.6                    | angiosarcoma       |

LA indicates left atrium; RA, right atrium; RV, right ventricle; and SVC, superior vena cava.
Disclosure

Conflicts of interest: All authors have no conflicts of interest relevant to the contents of this paper.

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