Endomyocardial Biopsy

Sigeru SAKAKIBARA, M.D. *and*
Souji KONNO, M.D.

A new instrument to obtain biopsy specimen of endocardium and myocardium was devised. More than 10 biopsy specimens were obtained from 5 patients without any untoward effect. The method is quite safe and useful in making an accurate diagnosis in cases in which the causes of diseases were uncertain.

It is possible to obtain the specimens from the heart by inserting the instrument through left basilic vein to right heart and via left axillary artery to the left.

A great progress has been made in the diagnostic techniques of cardiac diseases in recent years starting from the stethoscope. The techniques have made rapid progress to the electrocardiography, phonocardiography, angiocardiology, intracardiac catheterization and dye-dilution test, and now everything seems to have been studied out in the field of the diagnostic techniques of cardiac diseases.

There is, however, a group of cardiac diseases which are difficult to diagnose even with such excellent techniques. It is a group of "primary myocardial diseases" such as idiopathic myocardial hypertrophy, endocardial fibroelastosis, familial cardiomegaly, myocardial sarcoidosis, and myocardial tumors etc. (Table I).

These diseases can be suspected clinically but the definite diagnosis is made only by autopsy.^{1),2)} If one wants to diagnose the disease while the patient is alive, one will have to take out a part of the myocardium and examine it histologically.

However, needle biopsy is not applicable, being different from the liver and kidney, the heart is filled with blood of high pressure. By a commonly used very fine puncturing needle, it is practically impossible to obtain sufficient tissues for histological examination. Even if one gets enough tissues, the most important endocardial tissues for the examination

From the Department of Surgery of the Heart Institute and Hospital of Tokyo Women's Medical College, Tokyo.

Table I.

Idiopathic myocarditis
Myocarditis of collagen diseases
Endomyocardial fibrosis
Idiopathic cardiac hypertrophy
Sarcoidosis
Carcinomatosis
Primary myocardial tumors

are not obtained because the puncture is made from the outside of the heart.

The needle biopsy devised by Sutton is shown diagrammatically in Fig. 1. His work is important in the meaning that it developed a new

Fig. 1. Schema of the needle biopsy devised by Sutton.

way in the unexploited field, but has the aforementioned disadvantages. He performed the needle biopsy in 54 patients, but failed to obtain sufficient tissues for the examination in 24%. And naturally, the specimens obtained by this method did not contain the endocardial tissues. Therefore, a new instrument was devised with which both endocardium and myocardium could be obtained safely and steadily.

INSTRUMENT

Fig. 2 is a diagrammatical explanation of the structure of the new instrument. When one pulls the wire connected to the handle of the instrument, the 2 edges at the tip of the instrument will open apart and nip off the endocardium and myocardium (Fig. 3, A and B). The tissue piece thus obtained is small but sufficient for histological examination. The size of the tissue piece is compared with a ruler in the Fig. 4.

Fig. 2. Instrument for endomyocardial biopsy devised by Konno.

Fig. 3, A. Closed top edges of the instrument.

Fig. 3, B. Opened top edges of the instrument.

This instrument was first applied to dogs to examine its safetiness. Only one or 2 premature beats were noted when the end of the catheter pressed the cardiac wall and the edges nipped of the tissues, but otherwise the condition of the animal was not different from that in the ordinary cardiac catheterization. Fig. 5 shows the electrocardiogram at nipping off of the tissues.

Fig. 4. The size of the biopsy specimen is compared with a ruler.

Fig. 5. E.C.G. of a dog at nipping off the tissue.

Fig. 6. Diagrammatical explanation of the way to nipp off the endocardium.

Table II.

Case No.	Year	Sex	Clinical diagnosis	Histological diagnosis
1	30	M.	Primary myocardial disease	Endomyocardial fibrosis
2	13	M.	Primary myocardial disease	Idiopathic myocardial hypertrophy
3	19	M.	Primary myocardial disease	Chronic endomyocarditis
4	37	M.	Atrial septal defect	Myocardium normal
5	22	F.	Idiopathic premature beats	Endocardium and myocardium normal

As seen in Fig. 6, the instrument is inserted with the top-edges closed till they are pressed against the wall of the ventricle. Therefore, there is no danger of nipping off the valvular structures or the chorda tendineae. The position of the tip can be supervised by the monitor of intracardiac electrocardiography being led through the instrument during the procedure. But fluoroscopy is sufficient enough to determine the position of the tip. The instrument can be inserted through either vein or artery to both ventricles. This method has helped us in making an accurate diagnosis in several cases which had been undiagnosed otherwise.

CLINICAL STUDY

Ten biopsy specimens were obtained from 5 patients without any untoward effect. Only one or 2 ventricular premature beats were noted temporarily during the procedure. This instrument can be used safely even in the patients who have ventricular premature beats or A-V block (case 3 and 5). For the histological examination of the specimen, hematoxylin-eosin is applied as a routine staining and Van Gieson's staining and Weigert's elastic fiber staining are applied when necessary. The results are presented in Table II. Clinical data of some patients will be illustrated here briefly. Further clinical study and pathological explanation will be presented at a later date.

Case 1. This patient was a 30-year-old male who denied any history of rheumatic fever. An enlarged heart of unknown cause was detected 2 years prior to the admission, when he complained of cough and dyspnea. ECG showed right bundle branch block and multifocal ventricular premature beats. Faint systolic murmur was noted at the pulmonary ostium. No cardiac anomaly was detected by intracardiac catheterization and angiocardiology. Endomyocardial biopsy was performed on March 22, 1962. Fig. 7 shows histological picture of biopsy specimen by which endomyocardial fibrosis was diagnosed. Fig. 8 shows a chest X-ray of this patient.

Case 2. This patient was a 13-year-old boy. An enlarged heart

Fig. 7. Histological picture of Case 1.

Fig. 8. Chest X-ray of Case 1.

Fig. 9. E.C.G. of Case 2 at nipping off the tissue.

and ventricular hypertrophy were detected 5 years prior to the admission. For the past 5 years he has suffered from several attacks of anginal pain. Faint systolic murmur was noted at the apex. ECG showed ventricular hypertrophy. Intracardiac catheterization revealed no abnormality. Endomyocardial biopsy was performed on March 24, 1962. Fig. 9 shows ECG at nipping off the tissue. Fig. 10 shows the histological picture of biopsy specimen by which idiopathic cardiac hypertrophy was diagnosed.

Fig. 10. Histological picture of Case 2.

CONCLUSION

The method of endomyocardial biopsy is just at the beginning, and there are only a few cases in which this method has been applied. We are continuing the study in an attempt to elucidate the pathogenesis of primary myocardial diseases to find the nature of so-called "idiopathic" cardiomegaly. The further investigations will be presented at a later date.