Endomyocardial biopsy technique in infants and small children

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Summary

Endomyocardial biopsy is performed when a histological diagnosis is required, e.g. in patients with cardiac failure due to unknown causes, in anthracycline toxicity, and to evaluate cardiac transplant rejection. Right ventricular endomyocardial biopsy has been carried out in 10 infants and small children (average age 14 months); the technical aspects of the procedure are discussed. Performed by a paediatric cardiologist endomyocardial biopsy in infancy is as safe as a routine cardiac catheterization.

Transvascular endomyocardial biopsy is used increasingly in adult cardiology. The management of acute rejection episodes in cardiac transplantation is the most important indication for this procedure but it has also been used for the evaluation of patients with unexplained heart failure and in the assessment of patients receiving anthracycline cardiotoxic drugs.

When done by an experienced cardiologist, endomyocardial biopsy is as safe as routine cardiac catheterization. Rare complications in adults have included ventricular arrhythmia requiring electroconversion, cerebral embolus, right-sided pneumothorax and haemopericardium from ventricular perforation. Less serious side-effects have included unpleasant sensations, chest discomfort and short runs of ventricular or supraventricular arrhythmia.

Transvascular endomyocardial biopsy has recently been described in children and we are now investigating children with unexplained cardiac failure using this technique. The technical aspects of the procedure are discussed; the full results of the research project will be reported in due course.

Patients and methods

The study began in October 1984 and comprised 10 patients (aged 2 months - 3½ years; average 14 months) admitted to the Red Cross War Memorial Children's Hospital with a diagnosis of acute cardiac failure due to unknown aetiology. Endomyocardial biopsy was performed in an attempt to differentiate between the three types of acute endomyocardial disease (endocardial fibro-elastosis, acute myocarditis and idiopathic dilated cardiomyopathy) by histological means. The biopsy was done 10-14 days after admission when the child was haemodynamically stable and established on digitalis and diuretic therapy. During the same period (October 1984 - September 1985), 14 children died from acute endomyocardial disease, all within 48 hours of admission, i.e. before transvenous endomyocardial biopsy could be performed.

Informed parental consent for the biopsy was obtained. Coagulation studies were done before the procedure (prothrombin time, partial thromboplastin time and platelet count). Blood was cross-matched, and stabilized human serum was available in the cardiac catheterization laboratory for immediate use if necessary.

Patients were sedated as for routine cardiac catheterization (pethidine 2 mg/kg, promazine 0.5 mg/kg, promethazine 0.5 mg/kg given intramuscularly 45 minutes before the procedure). Infants were given a milk feed 1 hour before the cardiac catheterization, and older children were given nothing per mouth for 2½ hours after a light breakfast. The premedication was usually sufficient to keep the child sedated during the procedure, although intravenous injection of diazepam 0.2 mg/kg was given if the patient became restless during cardiac catheterization.

The patient was immobilized and the electrocardiogram monitored. After routine skin preparation the patient was draped with sterile towels, leaving the right groin exposed. Local anaesthetic (1% lignocaine) was infiltrated around the right femoral vein, especially the skin and the periosteum in the area. Using the Seldinger technique, the right femoral vein was cannulated with a Desilets-Hoffman sheath with a 5.0F outer diameter (Cook Inc., Bloomington, Indiana, USA). For this study, the right femoral artery was also cannulated with a similar sheath in an identical manner.

For the purpose of our study, full diagnostic right and left heart catheterization was performed: this included cine angiograms of the right ventricle (RV), the left ventricle (LV) and the aorta. When RV endomyocardial biopsy alone is done, only RV cine angiography is required to identify the anatomy.

Once all other haemodynamic investigations are completed, the various catheters are removed from the sheath and replaced by a 145 cm No. 5.0 F guidewire (Cook Inc.), which is passed via the inferior vena cava through the right atrium to the proximal superior vena cava. The Desilets-Hoffman sheath is then removed, leaving the guidewire in situ.

A Mullins Pediatric transseptal catheter-introducer sheath set (Fig. 1) No. 6.0 F (United States Catheter Inc., Billerica, Massachusetts) is advanced over the guidewire to a position in the superior vena cava. The guidewire and the dilator are removed and a Check Flo Assembly (Cook Inc.) is attached to the hub of the sheath (Figs 1 and 2). Via a 40 cm Disposable Connector Tube...
of the patient is often short and fat and thus vital neck structures could be endangered. We have not attempted LV endomyocardial biopsy since there is a small risk of embolization of endomyocardium or dislodgement of a thrombus from the dilated LV. This small risk outweighs the minimal additional information an LV endomyocardial biopsy specimen would provide.

The indications for endomyocardial biopsy are still controversial.12 Cardiac biopsy is the best way of diagnosing cardiac transplant rejection.10 In heart-lung transplantation endomyocardial biopsy is used to discover the existence of pulmonary allograft rejection.11 The diagnosis and quantitation of anthracycline cardiotoxicity using endomyocardial biopsy are well established in adults, but this is not the general practice in children.12

Much current research has been devoted to making a histological diagnosis of acute myocarditis by endomyocardial biopsy,13,14 and treating such patients with immunosuppressive drugs.15 This has been the indication for endomyocardial biopsy in infants and small children at Red Cross War Memorial Children’s Hospital, and these results will be reported separately. Heart transplantation in infancy and childhood may soon be attempted in the RSA, necessitating regular postoperative biopsies in these patients. Whatever the indication for endomyocardial biopsy, our experience confirms that this procedure does not increase the risks of cardiac catheterization in infancy, and deserves wider application in the management of paediatric cardiac disease.

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REFERENCES


Fig. 2. The biopsy forceps have been advanced through the Check Flo Assembly and through the sheath. The jaws of the forceps are open.