

# Long Sheaths for Endomyocardial Biopsy via Femoral Approach

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## Abstract

**Background-**Endomyocardial biopsy has long been a useful tool to evaluate myocardial diseases. It is a gold standard in diagnosing cardiac rejection and certain types of myocarditis, but there is always a risk for related complications. We have assessed the safety and feasibility of applying long sheaths in endomyocardial biopsy via the femoral approach.

**Methods-**We performed endomyocardial biopsy in 63 patients via the femoral approach and used a long sheath to guide biptome from the venous access to the interventricular septum and evaluate the procedure success and complications.

**Results-**Success rate (acceptable endomyocardial specimen) was 96%, and there were no complications (death, no death, urgent cardiac surgery, advanced cardiac life support, hemothorax, and pneumothorax).

**Conclusion-** Using long sheaths for the femoral approach seems to be safe and feasible; it confers an acceptable room to grab the endomyocardial samples while obviating the possibility of complications (*Iranian Heart Journal 2011; 12 (2):41-45*).

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**E**ndomyocardial biopsy is performed throughout the world and has contributed to a better understanding and treatment of certain cardiac conditions. It is the gold standard procedure for establishing the diagnosis of myocarditis, cardiac virus persistence, and acute cellular and humoral rejection following heart transplantation.<sup>1-4</sup> Initially, endomyocardial biopsies were obtained almost exclusively using the jugular vein approach. Later the femoral vein approach was tried as an alternative route to reach the myocardium but lost its initial attraction due to being limited to certain parts of the interventricular septum to take the biopsy.<sup>1-7</sup> This article presents our experience with 90 endomyocardial biopsies attempted from the femoral vein access with the use of long arterial sheaths as a guiding catheter.

Received Apr.21, 2010; Accepted for publication May. 19, 2011

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Between May 2009 and May 2011, 63 patients were referred for endomyocardial biopsy to our center. Most of them were cardiac transplant recipients and 10 patients had other diagnoses as idiopathic cardiomyopathies (4 patients) and restrictive cardiomyopathy (6 patients). We performed endomyocardial biopsy using long bipostomes (ARGON ENDOMYOCARDIAL BIOPSY FORCEP), introduced to the femoral vein and guided to the right ventricle through long arterial sheaths as a guiding catheter.

Vascular access was obtained via the right femoral vein under local anesthesia with 2% lidocaine. After the cannulation of the femoral vein, a 0.032-inch long J guide wire was advanced to the IVC and a long 7F sheath was inserted,

through which a pigtail catheter was advanced to the RV apex (Fig. 1,2).



**Fig. 1.** After femoral vein cannulation, a 0.032-inch long J guide wire is advanced to the IVC.

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**Fig. 2.** A pigtail catheter is advanced into the right ventricle.

The long sheath was advanced through the tricuspid valve over the pigtail catheter (Fig. 3). The pigtail was pulled back gently and then biopptome was advanced through the sheath slowly up to the middle of the apical segment of the right IVS under biplane fluoroscopic guidance (Figs. 4,5,6).



**Fig. 3.** A long sheath is passed over the pigtail catheter into the right ventricle.

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**Fig. 4.** The sheath is stabilized against the interventricular septum.

Once contact with the IVS was confirmed by premature ventricular complexes, the biptome was withdrawn 1 to 2 cm, and its jaws were opened and slowly advanced to engage the IVS. Gentle forward pressure was maintained while the jaws were closed. The biptome, containing the specimen, was removed by gentle traction on the shaft (Figs. 7,8).



**Fig. 5.** Biptome is advanced through the sheath without any risk of damage to surrounding structures.

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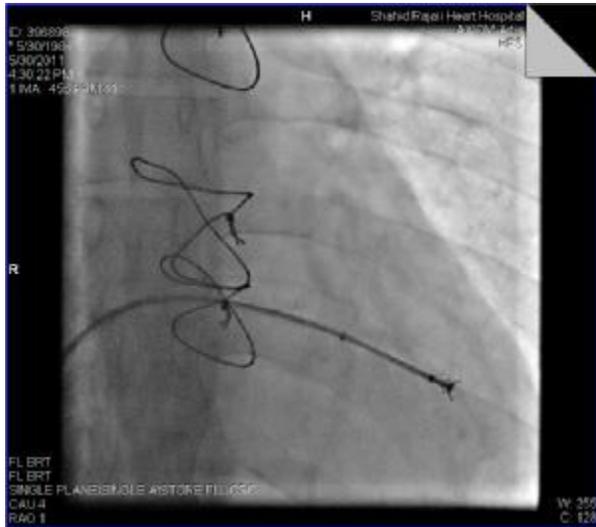


Fig.6. Jaws are opened to take the biopsy after a firm contact with septum is ensured.



Fig. 7. Biopptome grabs a sample of endomyocardium



Fig.8. Biopptome is taken out without any hazard for surrounding tissues.

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A twelve-lead ECG and a standard transthoracic echocardiographic examination were performed in all the patients before and after the EMB procedures to detect pericardial effusions, arrhythmias, and conduction abnormalities.

## Results

In this case series study, we had no death, urgent cardiac surgery, advanced cardiac life support, hemothorax, and pneumothorax. Only one patient developed pericardial effusion, and pericardiocentesis was performed for him after the procedure. This patient was a case of restrictive cardiomyopathy and endomyocardial biopsy had been performed for him via the jugular approach. The baseline characteristics and complication details are shown in Table I.

## Discussion

This case series reports a novel technique for endomyocardial biopsy via the femoral approach. The safety of this technique compares favorably with that of other reports with standard techniques. We used a long arterial sheath as a guiding catheter trapped in the trabeculae, providing room for simpler biopsy.

**Table I. Baseline characteristics and procedure-related events in jugular and femoral approaches**

	Femoral approach	Jugular approach
Age	32.3	33
Sex	F/M:18/72 (81.8%vs69.9%)	F/M:4/31 (18.2%vs30.1%)
Heart transplanted	83(66.4%)	32(25.6%)
Non heart transplanted	7(5%)	3(2%)
Pericardial tamponade with pericardiocentesis	0	1
Permanent complete AV block with permanent pacemaker require	0	0
Urgent cardiac surgery	0	0
Advanced cardiac life support	0	0
Hemothorax or pneumothorax	0	0
Death	0	0
New Small pericardial effusions	0	1
Increase pericardial effusions	0	0
RBBB sustained (>24 h)	0	0
RBBB temporary (<24 h)	4	1
AV block II Mobitz, 2:1 periprocedural (<10 min) requiring 0.5 to 1 mg atropine	0	0
AV block III periprocedural (<10 min) requiring 0.5 to 1 mg atropine	0	0
AV block III temporary (<24 h)	0	0

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h) requiring atropine, temporary pacemaker		
Non-sustained ventricular tachycardia $\geq 10$ ventricular complexes)	0	0
Episode (<12 h) of atrial fibrillation	1	0
Episode (>12 h) of atrial fibrillation	0	0
Persistent atrial fibrillation with cardioversion	0	0

As the biptome passes through a sheath to reach the myocardium, the possibility of the biptome head damage would be negligible, i.e. less myocardial rupture, tamponade, and tricuspid valve damage. Moreover, the possibility of the chorda tendinae wrapping round the head of the biptome will be close to zero. In our case series, there was no pericardial tamponade, hemothorax, and pneumothorax and the overall success rate was 96.6%. In a case series study, Goy et al.<sup>3</sup> reported 269 biopsies through trans-septal long sheaths with no hemothorax and tamponade and 97% success in obtaining sufficient samples.

Along with a higher safety profile, better sheath torquability seems to provide the operator with more endomyocardial interfaces to grab the samples. Besides, the operator can reduce the fluoroscopy time as short as just to check the position of biptome-endomyocardial interface once the sheath is positioned firmly against the interventricular septum.

In the largest report of 3048 EMB procedures via the femoral approach, analyzing major and minor complications of this invasive procedure, Holzmann et al.<sup>2</sup> found that major complications like cardiac tamponade requiring pericardiocentesis or complete atrioventricular block requiring permanent pacing were very rare: 0.12% in the retrospective study and 0% in the prospective study, much lower than those in earlier studies. In the case series by Goy et al.,<sup>3</sup> no conduction abnormality except for transient RBBB in 2% of the patients was reported. We had no complete atrioventricular block and tamponade using our technique in the femoral approach.

Compared to the minor complications in the Holzmann et al.<sup>2</sup> study, they had much less incidence of temporary RBBB (1.1 versus 4%), which may be explained by their high level of experience in performing EMBx (conducted by interventional cardiologists doing over 800 invasive procedures annually). All the RBBB cases in this case series were temporary, however.

In this case series, there was a case of transient AF rhythm (1.1% versus 0.95% in the Holzmann et al.<sup>2</sup> study) after the procedure; this patient had been recently recovered of acute cellular rejection during his first month of transplantation and had high filling pressures. In the clinical follow-up, this patient showed no long-term complications. No case of persistent AF rhythm was observed, and similar to the Holzmann et al.<sup>2</sup> study we had no complex ventricular arrhythmias such as non-sustained ventricular tachycardia with long runs of >10 ventricular complexes.

In the Holzmann et al.<sup>1</sup> study, 1.47% of the patients had developed variable degrees of atrioventricular block, treated with temporary pacemakers. All of them had unexplained left ventricular dysfunction and preexisting LBBB, while only a minority of our patients had LV dysfunction and/or LBBB. In contrast, our patients did not develop atrioventricular block of any type, transient or persistent, whatsoever.

An obvious advantage of the femoral approach is the absence of any risk of pneumothorax or hemothorax. We had also no access site complications like hematoma, bleeding or major vascular

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compromise and no air embolism despite no sheath irrigation in between the samplings. In the Goy et al.<sup>3</sup> study, limited femoral hematoma was noticed in 0.7% and vaso-vagal reaction occurred in 0.3%.

## Conclusion

We herein reported a novel technique for endomyocardial biopsy via the right femoral approach. The EMB procedure from the RV septum via this approach under biplane fluoroscopic guidance seems to be a safe procedure for evaluating patients candidated for EMBx, including heart transplant patients.

## Conflict of Interest

No conflicts of interest have been claimed by the authors.

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