# Implantation of Cardioverter Defibrillators: A Description of Two Clinical Cases

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**Summary**

*Automatic cardioverter-defibrillators Phylax AV (dual-chamber) and Phylax 06 (single-chamber) were implanted in two patients at the Department for Heart Arrhythmia Therapy of the Research Institute for Cardiology of Tomsk Scientific Center on September 13, 1999.*

**Key Words**

Ventricular tachycardia (VT), atrial flutter, implantable cardioverter-defibrillator (ICD)

## Implantation of a single-chamber implantable cardioverter-defibrillator (ICD) Phylax 06

Patient N. (born 1946) entered the Department for Heart Arrhythmia Therapy of the Research Institute for Cardiology of the Tomsk Scientific Center with diagnosed ischemia and angina pectoris of functional class III. After myocardial infarctions in 1994 and 1995, the patient's state was post-infarction cardiosclerosis and paroxysmal ventricular tachycardia. A bypass operation took place, and cryodestruction of the ventricular tachycardia focus was performed in 1996. The patient suffered from circulation insufficiency of the first degree.

From the anamnesis: In September 1994, the patient suffered from posterior-lateral myocardial infarction; short attacks of ventricular tachycardia combined with dyspnea appeared after that. From 1995 on, more serious tachycardia paroxysms started to occur, sometimes with loss of consciousness. They were terminated by lidocaine injection and electropulse therapy. Ventricular extrasystoles were registered on electrocardiograms between the paroxysms. Bypass operation on the right coronary artery and cryodestruction of the ventricular tachycardia focus were performed on March 28, 1996. Recidivisms of tachycardia paroxysms were registered in the postoperative period. Antiarrhythmic drugs, namely, cordaron, propaphenon, etacysin, and sotalex, were administered but had only short-term effects.

In a 24-hour ECG Holter monitoring, we registered 80,555 heartbeats, 356 ventricular extrasystoles (6 episodes of allorhythmia), and 71 supraventricular extrasystoles. The echocardiogram showed a diastolic left ventricular volume of 220 ml, a systolic left ventricular volume of 130 ml, thinning and akinesia caused by a type of cavitary aneurysm in the lower segment and lower septal segment. The ejection fraction was 40%.

The implantation of a Phylax 06 ICD (BIOTRONIK) and a Kainox RV 75 lead (BIOTRONIK) was performed on September 13, 1999. The lead was positioned in the right ventricle. The amplitude of the R-wave was 6.5 mV, the impedance was 650 Ω, and the pacing threshold was 0.4 V. Ventricular fibrillation was induced and terminated by a single automatic shock of 21 J (Figure 1). The patient is administered solatex in a dose of 80 mg twice daily and received antibiotics in the postoperative period. The ICD performance was checked on September 22, 1999: The pacing threshold was 0.8 V, the impedance was 493 Ω.

The device was programmed to antibradycardia pacing with a basic rate of 45 bpm, a pulse amplitude of 4.5 V,

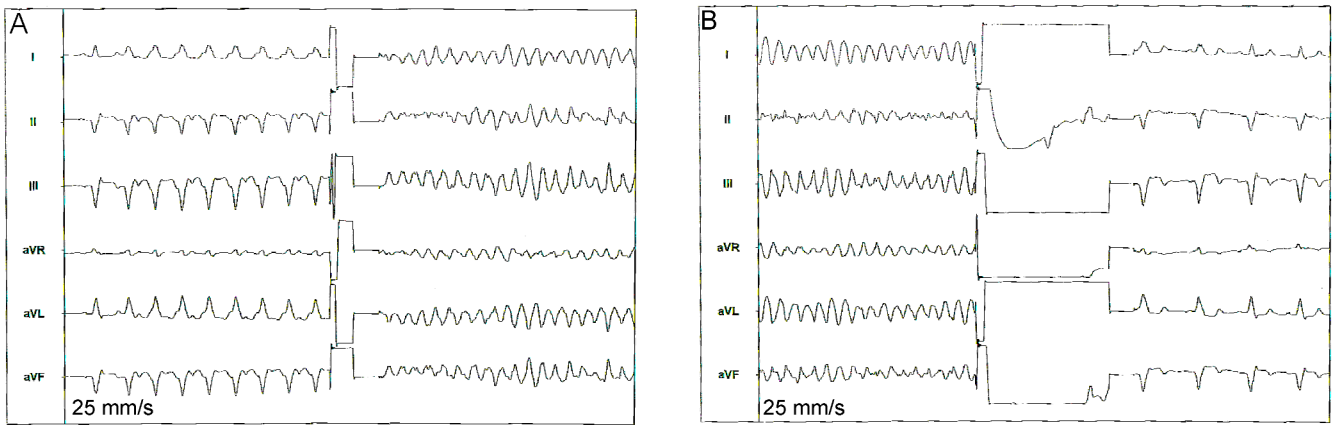


*Figure 1. Intraoperative test: A) Induction of ventricular fibrillation (R-R = 480 ms, R-Shock = 340 ms); B) Termination of ventricular fibrillation by automatic shock delivered by the Phylax 06 ICD.*

and a pulse width of 0.5 ms. It was set to detect ventricular tachycardia when 5 of 8 consecutive ventricular complexes had R-R intervals shorter than 402 ms. The following order of intervention was programmed: First, an attempt to recover sinus rhythm by antitachycardia pacing, then, two series of electric shocks of 5-9-30 J and 20-30-30 J. There were no complications in the postoperative period. The stitches were taken out on the 8th day.

### Implantation of a dual-chamber ICD Phylax AV

Patient Sh. (born 1939) entered the clinic with a diagnosis of ischemia and post-infarction cardiosclerosis (1998). The patient had a chronic aneurysm of the left ventricle. The state after a bypass operation included resection of the aneurysm of the left ventricle and plastic correction of the ventricular septum defect. Paroxysms of atrial flutter and ventricular tachycardia occurred. The patient suffered from circulation insufficiency of the first degree. Slowly progressing hypertension of the second degree was present as concomitant disease.

In January 1998, the patient suffered from posterior transmural myocardial infarction that was complicated by a rupture of the ventricular septum, aneurysm of the left ventricle, and paroxysms of atrial flutter. The paroxysms were terminated by novocainamide injection. Cordaron was administered to the patient. In April 1998, a bypass operation, plastic correction of the ventricular septum defect, and resection of the aneurysm were performed. After discharge, atrial tachycardia paroxysms appeared once or twice a month and were terminated by novocainamide and electropulse therapy. The state worsened on August 21, 1999, when ventricular tachycardia paroxysms devel-

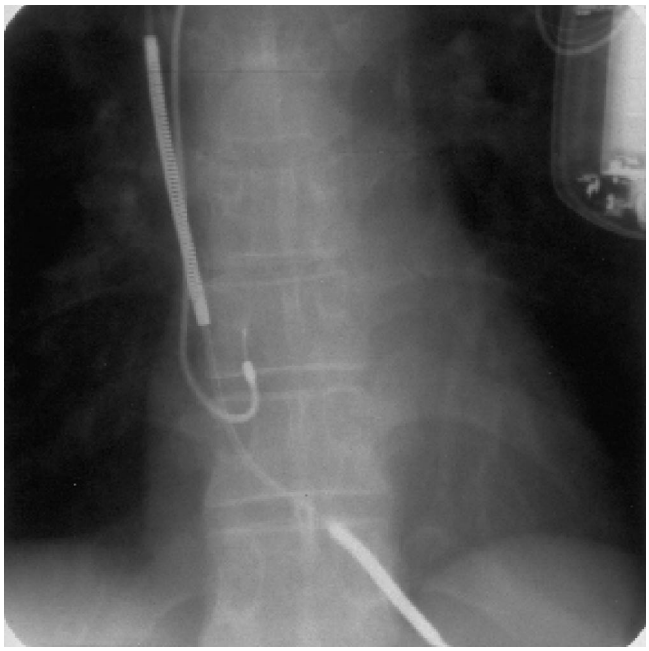

*Figure 2. X-ray photograph of the implanted dual-chamber ICD Phylax AV (Biotronik) with a shock lead in the right ventricular apex and a pacing lead in the lateral part of the right atrium.*

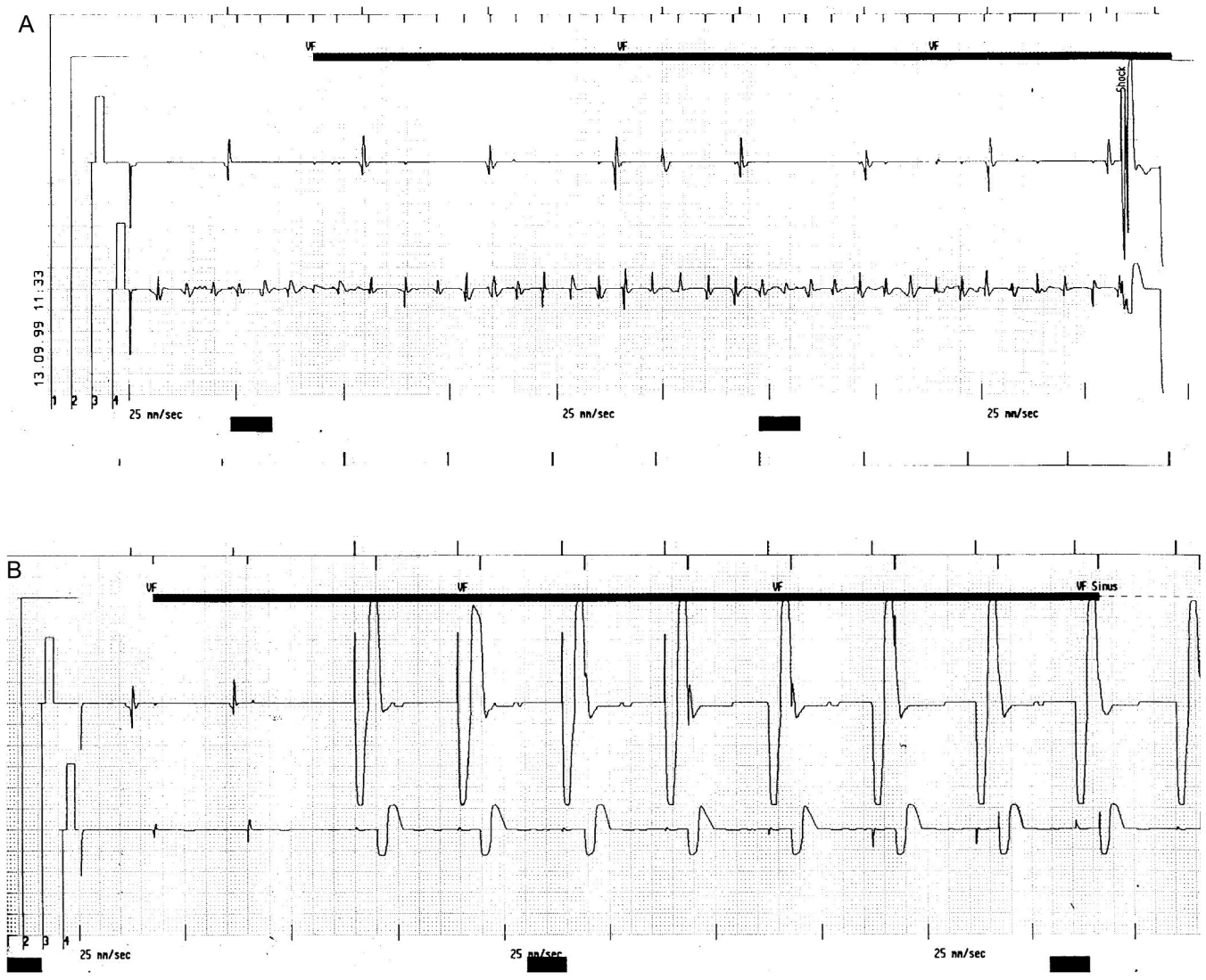


*Figure 3. A) Atrial and ventricular electrograms recorded during ventricular fibrillation (VF) and effective shock delivery of 20 J for its treatment in a VT patient after implantation of a Phylax AV ICD; B) Recovery of sinus rhythm and consequent stimulation in DDD mode after effective defibrillation.*

oped, accompanied by discomfort in the heart region. The patient was transported to the Department for Heart Arrhythmia Therapy by emergency ambulance. Sinus rhythm was restored by an external 5 kV shock. The ventricular tachycardia paroxysm reappeared on September 11, 1999 in the clinic and was again terminated by electropulse therapy.

In the Holter ECG monitoring, we registered (over 22 hours 29 minutes) 60,120 heartbeats with a heart rate of 37 to 70 (mean value 44) bpm, 7 ventricular extrasystoles, and 71 supraventricular extrasystoles. The echocardiogram showed that the left atrium was 50 mm in diameter, the end-diastolic size of the left ventricle was 62 mm, and the end-systolic size of the left ventricle was 52 mm. The ejection fraction was 32%, the right ventricular size was 32 mm, and systolic pressure in the pulmonary artery was 50 to 55 mmHg. Enhanced diffuse hypokinesia combined with akinesia of the posterior lower wall and diskinesia of the ventricular septum and lower wall of the left ventricle injured by the aneurysm were apparent. Left-right overflow through the defective area of 2 to 4 mm with

a maximal gradient of 81 mmHg was detected in the lower part of the aneurysm.

A Phylax AV ICD with two leads was implanted on September 13, 1999 in accordance with the scheme presented in Figure 2.

The defibrillation lead was positioned in the right ventricular apex. The R-wave amplitude was 17.5 mV, slew rate (SR) was 2.2 V/s, and the pacing threshold was 0.3 V. The atrial lead was fixed in the lateral part of the right atrium. SR was 1.5 V/s, the impedance was 470 Ω, and the pacing threshold was 1.1 V. Ventricular fibrillation was initiated by the following stimulation parameters: R-R 500 ms, R-ES1 340 ms, shock of 1 J. A 20-J defibrillation shock was effective in terminating ventricular fibrillation (Figures 3 A-B).

The Phylax AV ICD was programmed in the supraventricular/ventricular tachycardia discrimination mode [1,2]. On September 14, 1999, DDD pacing was found to be inappropriate. X-ray examination showed dislocation of the distal tip of the atrial lead with a preserved sensing amplitude of 0.25 mV. Pacing was reset to VDD mode with a basic rate of 45 bpm; the ventricular pacing threshold was 1.1 V.

The device was programmed to detect ventricular tachycardia when 24 R-R intervals of 410 ms occur, and ventricular fibrillation when 5 of 8 complexes were shorter than 300 ms. Therapy of ventricular arrhythmia was programmed in stages: two attempts to terminate the ventricular tachycardia by antitachycardia pacing, then an electric shock of 3-5-11 J, followed by 6-20-30 J, after that, pacing in VVI mode with a basic rate of 60 bpm with a pulse amplitude of 7.2 V and a pulse width of 1 ms. The postoperative period has been progressing without complications.

## References

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