



## Successful implantation of a defibrillator for resynchronization therapy in two patients with central vein occlusion

Korhan Soylu<sup>a\*</sup>, Serkan Yüksel<sup>a</sup>, Sabri Demircan<sup>b</sup>

<sup>a</sup> Department of Cardiology, Faculty of Medicine, Ondokuz Mayıs University, Samsun, Turkey

<sup>b</sup> Department of Cardiology, Faculty of Medicine, Istanbul Bilim University, Istanbul, Turkey

### ARTICLE INFO

### ABSTRACT

#### Article History

Received 28 / 01 / 2014

Accepted 27 / 03 / 2014

#### \* Correspondence to:

Korhan Soylu  
Department of Cardiology,  
School of Medicine,  
Ondokuz Mayıs University,  
Samsun, Turkey  
e-mail: korhansoylu@yahoo.com

Central vein occlusion (CVO) or stenosis (CVS) is a significant problem during implantation of transvenous pacemaker lead and may cause failure of the process. In this report, we presented two cases of cardiac resynchronization therapy defibrillator (CRT-D) implantation in patients with CVO and CVS after successful recanalization with balloon angioplasty.

*J. Exp. Clin. Med., 2014; 31:255-257*

#### Keywords:

Angioplasty  
Central vein occlusion  
Cardiac resynchronization therapy  
Heart failure

© 2014 OMU

### 1. Introduction

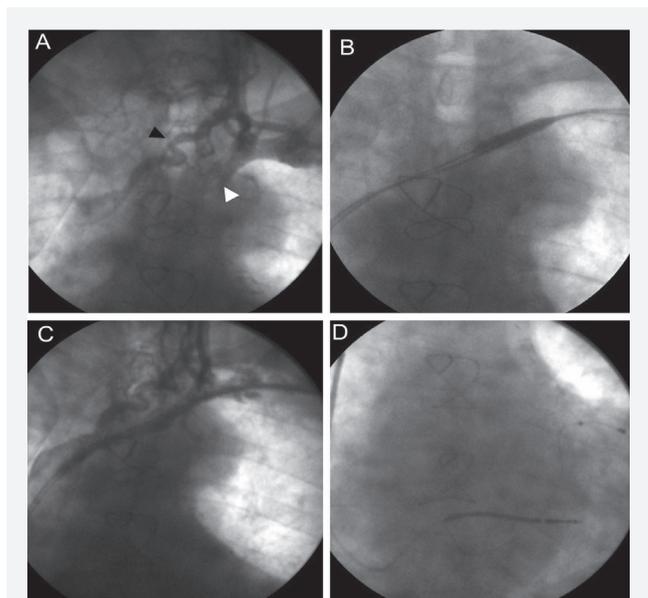
Cardiac resynchronization therapy (CRT) has become the standard of care for the treatment of heart failure with decreased ventricular function and conduction delay who remain symptomatic despite optimal medical therapy. However, device implantation may be difficult or unsuccessful because of various reasons (Brignole et al., 2013).

Central vein occlusion (CVO) or stenosis (CVS) is a significant problem during implantation of transvenous pacemaker lead. This problem is seen frequently in patients with chronic renal disease who underwent hemodialysis because of catheter reimplantations (Saad et al., 2010). In this report, we presented two cases of CRT defibrillator (CRT-D) implantation in patients with CVO and CVS after successful recanalization with balloon angioplasty.

### Case 1

A 67-year-old woman referred for placement of a CRT-D implantation because of prolonged QRS duration and New York Heart Association (NYHA) Functional Classification III heart failure despite appropriate medical therapy. She had a history of hypertension, prior coronary bypass surgery, and left ventricular dysfunction. Her twelve-lead electrocardiogram demonstrated atrial fibrillation and prolongation of the QRS interval measured 165 msec, and her ejection fraction was 0.35 by echocardiography.

For venous access, the left subclavian vein was punctured under local anesthesia with an 18-gauge needle. However, at the left subclavian vein, the guide wire could not be further advanced due to total occlusion of the vessel. The venography showed occlusion of the innominate vein with significant collateral flow (Fig. 1A). The standard hydrophilic



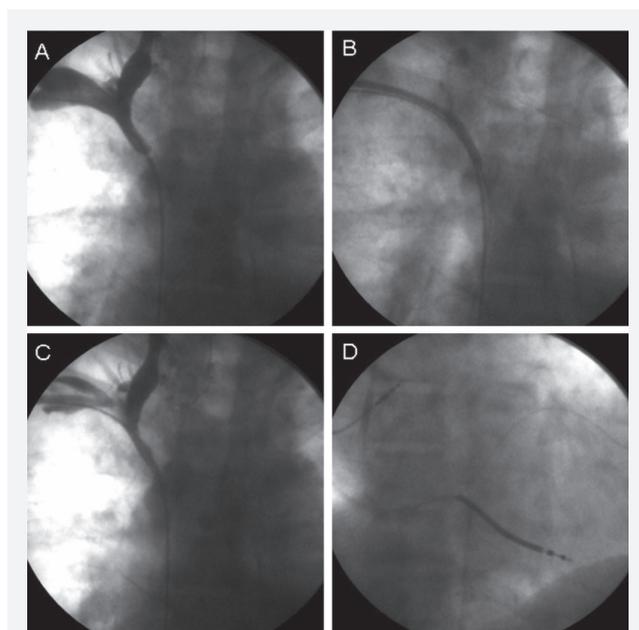
**Fig. 1.** **A:** Injection of contrast demonstrated occlusion of the left innominate vein (white arrowhead) and collateral flow (black arrowhead). **B:** Balloon angioplasty of innominate vein. **C:** Venography after dilatation. **D:** Final imaging of CRT-D implantation

0.035-in. guidewire with an angled tip was carefully introduced despite occlusion. A long guiding sheath was placed in the right atrium and the defibrillator lead was placed in the right ventricular apex. Nevertheless, the next sheath could not be advanced and was decided to perform balloon angioplasty. The occlusion was dilated by a balloon catheter sized 4.0x20 mm. The balloon was inflated to 12 atm pressure for three times (Fig. 1B). After balloon dilatation, venography performed again and reanalyzed innominate vein was seen (Fig. 1C). A long guiding sheath was used successfully to perform selective coronary sinus (CS) tributaries venography. Then, pacemaker lead was advanced to the distal part of the lateral branch of the coronary sinus. The procedure was terminated without complication (Fig. 1D).

## Case 2

A 64-year-old man with a history of chronic renal failure on hemodialysis was presented with sudden cardiac death followed by a successful cardio-pulmonary resuscitation (CPR). His electrocardiography (ECG) demonstrated prolongation of the QRS interval measured 155 msec, and his ejection fraction was 0.25 by echocardiography. He had a history of three procedures of arteriovenous fistulae on both arms. We decided to implant a CRT-D.

Due to the presence of a left sided fistula, a right sided approach was attempted. He previously had numerous cannulations of the veins on the right side including subclavian lines for dialysis. Vascular access was gained via the right subclavian vein, however wire could not be advanced. Venography showed severe stenosis of right innominate vein (Fig. 2A). The stenosis was dilated by an angioplasty balloon catheter sized 4.0x20 mm (Fig. 2B). The balloon was inflated to 12 atm pressure for four times. After balloon dilatation, reanalyzed vessel was demonstrated on repeat venography (Fig. 2C). The standard hydrophilic 0.035-in guidewire with an angled tip was carefully introduced. After placing the sheath, the tip of the defibrillator lead was placed



**Fig. 2.** **A:** Injection of contrast demonstrated severe stenosis of the right innominate vein. **B:** Balloon angioplasty of innominate vein. **C:** Venography after dilatation. **D:** Final imaging of CRT-D implantation

in the right ventricular apex. A long guiding sheath was used successfully to perform selective CS tributaries venography. The pacemaker lead was advanced to the distal part of the lateral branch of the CS. Finally, atrial lead was placed in the right atrial appendix. The procedure was terminated without complication (Fig. 2D)

## 2. Discussion

CRT-D has become an accepted method for treating refractory heart failure in patients with idiopathic or ischemic dilated cardiomyopathy associated with electromechanical asynchrony. In the current American College Of Cardiology And American Heart Association (ACC/AHA) guidelines, CRT is a class I therapy for patients with a left ventricular ejection fraction (LVEF) less than or equal to 35% and a QRS duration greater than or equal to 120 msec who are symptomatic (NYHA functional Class III or IV) despite optimal recommended medical therapy (Jessup et al., 2009). However, some technical problems have still been encountered during implantation of a device.

CVS is a common complication of the central venous catheter placement (Agarwal, 2009). Pacemaker and defibrillator wires are associated with a high incidence of CVS. Increasingly liberal use of peripherally inserted central catheters is likely to increase the incidence of CVS. Dilatation of CVS was performed as described in previous reports (Sauter et al., 2008, Haller et al., 2009, Saad et al., 2010). The majority of these reports are in patients that already have a pacemaker at the time of arteriovenous (AV) fistula creation in the ipsilateral arm, and generally associated with subclavian vein cannulation. However, angioplasty for pacemaker placement observed in a small number of cases. In our cases, recanalization of central veins was performed in combination with implantation of pacemaker leads. Luedorff et al. (2009) similarly placed pacemaker lead in 4 patients with central venous occlusion or stenosis immediately after recanalization. Also, Rogers et al. (2007) placed pacemaker

lead in a patient with subclavian stenosis after venoplasty.

Angioplasty of CVS has a very high incidence of restenosis and repeat intervention (Sauter et al., 2008). But, in our cases that already had asymptomatic occlusion. Therefore, the

possibility of restenosis is not a handicap for implantation. In summary, central vein angioplasty may be an option for pacemaker lead placement in patients with CVS.

## REFERENCES

- Agarwal, A.K., 2009. Central vein stenosis: Current concepts. *Adv. Chronic. Kidney. Dis.* 16, 360-370.
- Brignole, M., Auricchio, A., Baron-Esquivias, G., Bordachar, P., Boriani, G., Breithardt, O.A., et al., 2013. ESC Guidelines on cardiac pacing and cardiac resynchronization therapy: The task force on cardiac pacing and resynchronization therapy of the European Society of Cardiology (ESC). *Eur. Heart J.* 34, 2281-329. doi: 10.1093/eurheartj/ehs150.
- Haller, C., Déglise, S., Saucy, F., Mathieu, C., Haesler, E., Doenz, F., Corpataux, J.M., Qanadli, S.D., 2009. Placement of hemodialysis catheters through stenotic or occluded central thoracic veins. *Cardio. Vasc. Interv. Radiol.* 32, 695-702.
- Jessup, M., Abraham, W.T., Casey, D.E., Feldman, A.M., Francis, G.S., Ganiats, T.G., et al. 2009. ACCF/AHA Guidelines for the Practice Guideline: Focused update diagnosis and management of heart failure in adults. *Circulation.* 119, 1977-2016.
- Luedorff, G., Grove, R., Kranig, W., Thale, J., 2009. Different venous angioplasty manoeuvres for successful implantation of CRT devices. *Clin. Res. Cardiol.* 98, 159-164.
- Rogers, D.P., Lambiase, P.D., Chow, A.W., 2007. Successful coronary sinus lead replacement despite total venous occlusion using femoral pull through, two operator counter-traction and subclavian venoplasty. *J. Interv. Card. Electrophysiol.* 19, 69-71.
- Saad, T.F., Myers, G.R., Cicone, J., 2010. Central vein stenosis or occlusion associated with cardiac rhythm management device leads in hemodialysis patients with ipsilateral arteriovenous access: A retrospective study of treatment using stents or stent-grafts. *J. Vasc. Access.* 11, 293-302.
- Sauter, A., Triller, J., Schmidt, F., Kickuth, R., 2008. Treatment of superior vena cava (SVC) syndrome and inferior vena cava (IVC) thrombosis in a patient with colorectal cancer: Combination of SVC stenting and IVC filter placement to palliate symptoms and pave the way for port implantation. *Cardio. Vasc. Interv. Radiol.* 31, 144-148.