View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Elsevier - Publisher Connector

BRIEF COMMUNICATIONS

TRICUSPID VALVECTOMY FOR RIGHT VENTRICULAR OUTFLOW CANNULA OCCLUSION WITH THE THORATEC VENTRICULAR ASSIST DEVICE

Richard J. Kaplon, MD, Xiao-shi Qi, MD, Fotios M. Andreopoulos, PhD, Mark B. Anderson, MD, Eugene Bauerlein, MD, Antoni Nejman, MD, and Si M. Pham, MD, *Miami, Fla*

The Thoratec (Thoratec Laboratories, Berkeley, Calif) ventricular assist device (VAD) is a pneumatically actuated paracorporeal system approved for use as a bridge to transplantation and designed to provide either univentricular or biventricular long-term support. Although inflow to the device has traditionally been obtained from right atrial (for right VAD support) and left ventricular (for left VAD support) cannulation, it has been suggested that direct cannulation of the right ventricle might provide better filling and output of the right ventricular assist device (RVAD).[1,2] In this report we describe an interesting complication of direct right ventricular cannulation and discuss possible alternative strategies.

Clinical summary. A 33-year-old woman had a long-standing history of idiopathic dilated cardiomyopathy, pulmonary hypertension, and New York Heart Association class IV congestive heart failure. Transplantation had been offered to the patient for over a year; however, because of religious preferences, she had refused this therapy. Recently, the patient was admitted to the hospital with right upper quadrant pain, nausea, and vomiting. The patient was treated conservatively with nasogastric suctioning and intravenous antibiotics for a presumptive diagnosis of cholecystitis. She responded to therapy but soon experienced further decompensation of her heart failure. In her critical state the patient accepted transplantation and was listed with the United Network for Organ Sharing.

Despite maximal medical therapy with inotropic and pressor support, the patient remained hypotensive and anuric. After 7 days, she was referred for cardiac assist device placement. At that time, she had a cardiac index of 1.0 L/min, a pulmonary artery pressure of 31/26 mm Hg, a serum creatinine level of 4.0 mg/dL, and massive ascites. Intraoperatively, the patient was found to have severe biventricular failure. Because of her small size (body surface area, 1.5 m^2) and need for biventricular support, a Thoratec BiVAD was placed. Inflow to the device was obtained through the left ventricular apex and diaphragmatic surface of the right ventricle; outflow cannulas were anastomosed to the great vessels. The patient did well initially and was extubated by postoperative day 4. By day 6, the creatinine level had returned to 1.7 mg/dL, and she was tolerating a regular diet.

On day 7, pump flows decreased. Initially, the patient responded to fluid administration. Echocardiography suggested tamponade. Re-exploration evacuated clot overlying the right atrium and ventricle, and flows increased. Despite this initial improvement in hemodynamics and BiVAD output, flows continued to decrease over the course of the next 5 days. The patient became febrile and required reintubation. Renal and hepatic function worsened, and hematuria developed. Transesophageal echocardiography demonstrated RVAD inflow conduit obstruction. On re-exploration through the right atrium, the right ventricular inflow conduit was found to be occluded by the anterior leaflet of the tricuspid valve in its end hole and by the tricuspid subvalvular apparatus in its side holes. The tricuspid valve was excised, and BiVAD flows were restored. Unfortunately, the patient's multisystem organ dysfunction failed to resolve, and she died on postoperative day 24.

Discussion. The Thoratec VAD system has been shown to provide excellent support for patients requiring mechanical circulatory assistance while awaiting transplantation.[3-5] Several reports have suggested that better RVAD inflow might be obtained with right ventricular as opposed to right atrial cannulation.[1,2] In this patient we used the blunt-tipped ventricular cannula (catalog No. 14114-2572) for the left ventricular apical cannulation and the beveled metal-reinforced cannula (catalog No. 14111-2571) with 2 side holes for right ventricular cannulation. We believed that with its larger orifice area, this cannula would provide better right-sided drainage. Because of the intraventricular cannula length (5 cm vs 2.5 cm with the blunt-tipped cannula) and side holes, the tricuspid leaflets and subvalvular apparatus were sucked into the cannula when negative pressure was applied. This in turn compromised RVAD flow, thus diminishing left VAD flow. Furthermore, the turbulent flow across the partially occluded cannula likely caused hemolysis, as evidenced by the onset of hematuria at the same time that pump flow was compromised.

Although we still believe that ventricular cannulation will provide better inflow than atrial cannulation for patients requiring RVAD support, we now use the same blunt-tipped cannula for both left and right ventricular cannulation. Care is taken to direct the cannula away from the tricuspid valve by using preplacement and postplacement transesophageal

From the Division of Cardiothoracic Surgery, University of Miami/Jackson Memorial Hospital, Miami, Fla.

J Thorac Cardiovasc Surg 2001;121:812-3

Copyright © 2001 by The American Association for Thoracic Surgery

0022-5223/2001 $35.00 + 0 **12/54/110487**
doi:10.1067/mtc.2001.110487

echocardiographic guidance. Patients with smaller right ventricles, as seen with ischemic cardiomyopathy or patients undergoing reoperation at the time of RVAD placement, may still benefit from traditional right atrial cannulation.

Received for publication July 12, 2000; accepted for publication July 28, 2000.

Address for reprints: Richard J. Kaplon, MD, 1801 NW 9th Ave, 5th floor, Miami, FL 33136 (E-mail:rkaplon@med.miami.edu).

REFERENCES

1. Arabia FA, Paramesh V, Toporoff B, et al. Biventricular cannulation for Thoratec ventricular assist device. Ann Thorac Surg 1998;66:2119-20.
2. Pae WE, Lundblad O. Thoratec paracorporeal pneumatic ventricular assist device. Oper Tech Thorac Cardiovasc Surg 1999;4: 352-68.
3. Mavroidis D, Sun BC, Pae WE. Bridge to transplantation: the Penn State experience. Ann Thorac Surg 1999;68:684-7.
4. McBride LR, Naumheim KS, Fiore AC, et al. Clinical experience with 111 Thoratec ventricular assist devices. Ann Thorac Surg 1999;67:1233-8.
5. Hill JD, Farrar DJ, Hershon JJ, et al. Bridge to cardiac transplantation. Trans Am Soc Intern Organs 1986;32:233-7.