Use of nesiritide in Ebstein's anomaly

Morteza Tavakol MS MD, Lessan Banko MD, David Schifter MD FACC

M Tavakol, L Banko, D Schifter. Use of nesiritide in Ebstein's anomaly. *Int J Angiol* 2008;17(1):47-49.

A rare case of a 77-year-old man with congestive heart failure due to a previously diagnosed condition of Ebstein's anomaly is presented.

Unique to the present case is the treatment of New York Heart Association class IV congestive heart failure associated with Ebstein's anomaly with nesiritide.

Key Words: *Congestive heart failure; Ebstein's anomaly; Nesiritide*

Ebstein's anomaly is an abnormality of the tricuspid valve in which there is displacement of the septal and posterior leaflets from the atrioventricular annulus into the right ventricle, with so called 'atrialization' of a portion of the right ventricle. The extent of this deformity varies from minor malformations that produce few symptoms and clinical signs to significant deformities that cause hemodynamic malfunctions that lead to early mortality. As a result, the clinical presentation and the age of onset of symptoms in Ebstein's anomaly vary from patient to patient. The hemodynamic consequences of the malformed valves lead to tricuspid regurgitation, with the severity of the regurgitation depending on the extent of leaf displacement. This regurgitation is accentuated by the contraction of the atrialized portion of the right ventricle during systole, which causes a backward flow of blood into the right atrium (1). In addition to the acquired malformation, Ebstein's anomaly is commonly associated with other congenital, structural or conduction system diseases that may contribute to the morbidity of the condition, such as intracardiac shunts (atrial and ventricular septal defects), valvular lesions and accessory conduction pathways (eg, Wolf-Parkinson-White syndrome) (1). In the present study, we report a case of congestive heart failure (CHF) in an elderly man with Ebstein's anomaly. This is the first reported case of medical management of such a condition with nesiritide.

CASE PRESENTATION

A 77-year-old African American man presented to the emergency department with increasing shortness of breath and leg swelling of a duration of two days. The patient reported doing well initially when he was discharged from the hospital four weeks earlier for exacerbation of heart failure. He had had multiple hospitalizations over the past few years for CHF, and each time had been treated with intravenous diuretics. Recently, there had been decreased responsiveness to diuretics. Since his last hospital admission, he had been having increasing shortness of breath along with severe limitation of his activity, increasing leg edema, weakness and chest discomfort. His symptoms were made worse by exertion or by lying flat. There was no history of kidney or liver disease, oliguria, chest pain, palpitations, dizziness, fever, chills or cough. He had never been intubated, but was a former smoker and was on home oxygen therapy. Past medical history was significant for atrial

flutter/fibrillation with atrioventricular nodal ablation and dual chamber pacemaker implantation, chronic obstructive pulmonaryxes mellitus type II, hypertension, prostate cancer and generalized anxiety disorder.

Physical examination revealed a regular pulse rate of 76 beats/min, blood pressure of 130/100 mmHg and respiratory rate of 24 breaths/min. Heart sounds were regular, with an increased S2 component. A grade II/VI systolic murmur was appreciated, best heard at the right sternal border and increased intensity with Valsalva manoeuvre. Lung examination revealed bilateral basilar rales with good air entry and resonance to percussion. Further examination showed elevated jugular venous distention, positive hepatojugular reflux and 2+ leg edema, and a permanent pacemaker in the left anterior chest wall. The remainder of the physical examination was noncontributory.

The chest radiograph revealed a greatly enlarged cardiome-diastinal silhouette with a flask-shaped contour along with mild congestion of the pulmonary vessels. A review of a recent echocardiogram showed severe tricuspid regurgitation with an apically displaced tricuspid leaflet valve with failure of coaptation of the tricuspid leaflets, an elevated right ventricular pressure of 50 mmHg to 60 mmHg, and a flattened interventricular septum with paradoxical septal motion. Left ventricular function was reduced with an ejection fraction of 44%. Markedly enlarged right atrium and ventricle were also observed (Figure 1). An electrocardiogram showed atrioventricular paced rhythm at 68 beats/min. There were no P waves identified (Figure 2). Venous blood samples obtained showed markedly elevated brain natriuretic peptide levels of 1508 ng/L (Table 1).

Before the current admission, the patient had been taking 40 mg furosemide and 0.125 mg digoxin, along with medications for prostate cancer (bicalutamide 50 mg), anxiety (clonazepam 0.5 mg, sertraline 25 mg), diabetes (glyburide 2.5 mg) and chronic obstructive pulmonary disease (albuterol nebulizer, prednisone 10 mg), all daily, and warfarin 2.5 mg on alternate days. Due to the recent unresponsiveness to intravenous diuretics, a trial of nesiritide was instituted. In addition to the conventional CHF therapy of diuretics, an initial dose of 140 µg infusion of nesiritide was given followed by 1.5 mg intravenous injections of nesiritide for a total of four days. A significant response to the course of treatment was observed with the patient reporting decreasing dyspnea and shortness of breath. There was an improvement in leg edema and orthopnea, with

Department of Internal Medicine, New York Methodist Hospital, Brooklyn, New York, USA

Correspondence: Dr Morteza Tavakol, New York Methodist Hospital, Department of Internal Medicine, 506 6th Street, Brooklyn, New York 11215, USA. Telephone 718-840-8393, fax 718-780-3259, e-mail motavakol@yahoo.com

Figure 1) Two-dimensional echocardiogram showing an enlarged right atrium (RA) and the right ventricle (RV) during diastole (A). Tricuspid leaflet separation is visible during systole, along with downward displacement of the tricuspid valve (TV) (B). Parasternal long axis view of enlarged RV with marked septal flattening (C). PPM Permanent pacemaker

the patient reporting greater ease with ambulating and sleeping. The patient was discharged home in stable condition.

DISCUSSION

Previous studies have recommended the need for surgery in all patients with Ebstein's anomaly whose condition, despite best medical therapy, has deteriorated to New York Heart

Figure 2) Electrocardiogram showing ventricular paced rhythm at 68 beats/min

TABLE 1
Baseline venous blood samples

White blood cell count	8.5 k/uL
Hemoglobin	15.7 g/dL
Hematocrit	45.2%
Platelet count	254 k/uL
Sodium	136 mmol/L
Potassium	5.4 mmol/L
Blood urea nitrogen	37 mg/dL
Creatinine	1.2 mg/dL
Glucose	112 mg/dL
Troponin T	0.01 ng/mL
Brain natriuretic peptide	1508 ng/L

Association (NYHA) functional class III or IV (2). We report the first known case of CHF exacerbation in an Ebstein's anomaly patient treated with nesiritide. Previous reports have shown that less than 5% of patients with Ebstein's anomaly live beyond the age of 50 years, with 60% of those who survive infancy attaining adulthood with NYHA class I or II CHF (3). The presentation and outcome of Ebstein's anomaly is variable and is dependent on a number of factors. The most common presentation in adolescents and adults is supraventricular arrhythmia (2). Our patient had a long-standing history of atrial arrhythmias that predated his heart failure symptoms by many years. In adults, the important predictors of outcome are NYHA functional class (III and IV), heart size (greater than 0.65 cardiothoracic ratio), presence or absence of cyanosis and tachyarrhythmias, presence of Wolf-Parkinson-White syndrome and right atrial pressure (greater than 10 mmHg) (2,4). Such tachycardias commonly lead to the initial presentation or worsening of heart failure, cyanosis or even syncope. To date, there have been seven reported patients surviving longer than 70 years (5,6), with the oldest known case being an 85-year-old man (7).

Classic treatment of this condition includes diuretics, afterload reduction with angiotensin-converting enzyme inhibitors and beta-blockers, as in other types of CHF. These agents were not used in our patient due to his severe chronic obstructive pulmonary disease and previous hyperkalemia. Nesiritide is a recombinant human brain natriuretic peptide. Intravenous infusion of nesiritide in patients with decompensated CHF results in beneficial hemodynamic actions, including arterial and venous dilation, enhanced sodium excretion,

and suppression of the renin-angiotensin-aldosterone and sympathetic nervous systems (8). We treated this patient with nesiritide due to a lack of response from traditional medications used in treatment of CHF.

We report here the first successful management of CHF exacerbation with nesiritide in a 77-year-old man with Ebstein's anomaly. Although our patient was a long-term

survivor with Ebstein's anomaly, there is potential in reducing symptomatic recurrences of CHF and preventing repeated hospitalization. This may be extremely beneficial to younger patients with CHF and Ebstein's anomaly. Further investigation is necessary but perhaps therapy with nesiritide could also delay or minimize the need for surgical correction in younger patients with Ebstein's anomaly.

REFERENCES

1. Brickner ME, Hillis LD, Lange RA. Congenital heart disease in adults. First of two parts. *N Engl J Med* 2000;342:256-63.
2. Mair DD. Ebstein's anomaly: Natural history and management. *J Am Coll Cardiol* 1992;19:1047-8.
3. Hong YM, Moller JH. 1993. Ebstein's anomaly: A long-term study of survival. *Am Heart J* 1993;125:1419-24.
4. Gentles TL, Calder AL, Clarkson PM, Neutze JM. Predictors of long-term survival with Ebstein's anomaly of the tricuspid valve. *Am J Cardiol* 1992;69:377-81.
5. Cabin HS, Wood TP, Smith JO, Roberts WC. Structure--function correlations in cardiovascular and pulmonary diseases (CPC): Ebstein's anomaly in the elderly. *Chest* 1981;80:212-4.
6. Makous N, Vander Veer JB. Ebstein's anomaly and life expectancy. Report of a survival to over age 79. *Am J Cardiol* 1966;18:100-4.
7. Seward JB, Tajik AJ, Feist DJ, Smith HC. Ebstein's anomaly in an 85-year-old man. *Mayo Clin Proc* 1979;54:193-6.
8. Colucci WS, Elkayam U, Horton DP, et al. Intravenous nesiritide, a natriuretic peptide, in the treatment of decompensated congestive heart failure. Nesiritide Study Group. *N Engl J Med* 2000;343:246-53. (Errata in 2000;343:1504; 2000;343:896).