

## Heart Carcinoid Disease with Patent Foramen Ovale Treated by Mini Sternotomy

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### ABSTRACT

This case report was an attempt to present the importance of diagnostic echocardiography and closure of a patent foramen ovale in carcinoid heart disease. Herein, we present a case of a 48-year-old woman with a carcinoid metastasis presenting with tricuspid regurgitation, pulmonic stenosis, patent foramen ovale, and borderline left ventricular ejection fraction on an echocardiogram. Surgical intervention included closing the patent foramen ovale and replacing the tricuspid valve via mini-sternotomy. The tricuspid valve was repaired and the ejection fraction was preserved. The patient had an uncomplicated post-operative course. As indicated in this report, closing the patent foramen ovale along with fixing malfunctioning valves can improve the ejection fraction and the associated symptoms.

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### Introduction

Carcinoid tumors are rare indolent neuroendocrine tumors, which typically appear in the gastrointestinal tract and cause such symptoms as episodic flushing, secretory diarrhea, bronchospasm, hypotension, and carcinoid syndrome. Carcinoid syndrome, which typically arises after liver metastasis, is caused by the overproduction of serotonin from tryptophan along with excessive amounts of histamine, prostaglandins, and kallikrein (1-3).

Cardiac involvement occurs in one-half to two-thirds of the cases with carcinoid syndrome and leads to the deterioration of clinical outcomes. The involvement of the heart typically produces right-sided heart failure along with tricuspid regurgitation, pulmonary regurgitation, and pulmonary stenosis. Tricuspid valve lesions are caused by plaque deposition of acid mucopolysaccharide-rich matrix that contracts the leaflets. Pulmonic valves tend to develop fibrosis on the cusps and coalescence of the commissures (4). About less than 10% of the

patients develop left-sided heart issues (1).

Case reports emphasize and support the use of echocardiography in detecting the extent of cardiac involvement in carcinoid diseases. Carcinoid heart disease on a transthoracic echocardiogram reveals the enlargement of the right atrium and ventricle along with the thickening of the tricuspid and pulmonary valve leaflets (4). Regurgitation can occur on the tricuspid and pulmonary valve while stenosis is frequently observed on the pulmonary valve. These findings produce right-sided heart failure in individuals with carcinoid heart disease (2, 5).

### Case presentation

A 48-year-old Hispanic female with a history significant for carcinoid syndrome presented with transient ischemic attack symptoms along with shortness of breath. The patient had a past medical history of carcinoid disease, involving multiple liver metastases. The carcinoid symptoms were controlled adequately with

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octreotide. An echocardiogram revealed right heart involvement, including tricuspid regurgitation, mild pulmonic regurgitation and stenosis, as well as preserved right ventricular function. The echocardiogram also showed a patent foramen ovale. Furthermore, readings from the echocardiogram indicated a reduced borderline left-ventricular ejection fraction (50-54%). A Surgery was scheduled to replace the tricuspid valve, inspect the pulmonary valve, and close the patent foramen ovale.

The goals of the surgical operation included inspecting the pulmonary valve, replacing the tricuspid valve, and closing the patent foramen ovale. The operation initiated with a mini-sternotomy; accordingly, an inverted T-shaped incision into the fourth intercostal space was performed bilaterally in order to gain access to the thoracic cavity. Cardiopulmonary bypass was performed using the aortic cross-clamping.

Following an acceptable diastolic arrest, the main pulmonary artery was opened to inspect the pulmonary valve. Although it presented with mild stenosis and regurgitation, the valve was sufficiently stable to be left alone. The pulmonary arteriotomy was closed with 4-0 Prolene sutures.

Attention was directed toward the right atrium through an oblique atriotomy to reveal the patent foramen ovale. The defect was identified at the cephalic end of the fossa ovalis. The closure of the foramen ovale was conducted using Prolene sutures in two layers. After the closure of the atrial septal defect, the tricuspid valve was targeted. The tricuspid valve was significantly affected, presenting whitish plaques subjacent to the leaflets. The tricuspid leaflets were excised along with the plaques. However, a 2 mm rim of septal leaflet tissue was preserved to avoid injury to the cardiac conduction system. Following the excision of the tricuspid leaflets, a 31 mm Magna Mitral Ease valve [Irvine, California, United States of America] was chosen to be replaced with the defective valve.

After accomplishing the standard procedure for replacing the tricuspid valves, the atriotomy was closed using a Prolene suture. Subsequently, the ascending aorta cross-clamp was removed after 49 min, and the cardiopulmonary bypass ceased after 83 min. Then, the patient was supported with dobutamine and norepinephrine. Additionally, the patient was managed with multiple doses of octreotide throughout the operation.

Three days after the operation, an echocardiography was performed to assess the situation following the surgical procedure, which revealed mild tricuspid and pulmonic regurgitation. However, the right ventricular systolic pressure was normal and no pericardial effusion was observed.

The patient remained in the hospital a week after the operation. No significant complications occurred during the hospital stay. She was discharged and prescribed to continue all her previous medications including octreotide. In addition to her prior medications, she was prescribed to consume 20 mg of furosemide [Lasix; Paris, France] per day. In addition, she was required to follow up with the oncologist in order to discuss her therapy concerning octreotide and also the cardiologist to discuss long-term cardiac care. Finally, the patient left the hospital comfortably and satisfied.

## Discussion

Carcinoid tumors are endocrine tumors that typically originate in the gastrointestinal tract, commonly the small intestine. While the tumor is malignant, it is the excessive secretion of serotonin and other metabolites that propagate the symptoms found in carcinoid syndrome, especially if there is liver metastasis (3). All of these findings were confirmed using echocardiography, a promising diagnostic tool for monitoring the progression of carcinoid syndrome (2, 5).

The patient was also presented with a patent foramen ovale. As indicated in the literature, under the influence of carcinoid syndrome symptoms, a patent foramen ovale can further complicate the patient's condition by inciting left-sided congestive heart failure (5). This patient had a borderline left ventricular ejection fraction of 50-54%; as a result, systolic heart failure would ensue without intervention. Consequently, the mini-sternotomy approach was successful with the replacement of the tricuspid valve and the closure of the patent foramen ovale, correcting the tricuspid regurgitation and hindering the progression toward systolic heart failure.

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## Conflict of Interest

The authors declare no conflict of interest.

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