of intermediate malignancy, wide surgical excision of the primary tumor is essential and radiotherapy is strongly recommended. Early follow-up to discover early local recurrences or metastasis is mandatory.

References


Carcinoid crisis and reversible right ventricular dysfunction after embolization in untreated carcinoid syndrome

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Received 3 May 2005; received in revised form 27 March 2006; accepted 14 April 2006
Available online 28 September 2006

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Case report

A 59-year-old white male with a history of episodic flushing, chronic diarrhea, and a 30-pound weight loss over the last year presented with abdominal pain. During the evaluation, computed tomography of the abdomen revealed multiple liver masses. Subsequent esophagogastroduodenoscopy and colonoscopy were both normal. A liver biopsy revealed a well-differentiated neuroendocrine carcinoma (carcinoid). A 24-h urine 5-hydroxyindoleacetic acid (5-HIAA) level was 620 mg/24 h (normal = 1.8–6.0 mg/24 h). An octreotide scan showed increased activity in the small bowel and throughout the liver, suggesting a primary midgut carcinoid tumor with hepatic metastases. The patient was referred to a tertiary care academic center for further management. Since the patient was considered a poor surgical candidate due to extensive metastases, he underwent hepatic artery embolization. He was pre-treated with an octreotide bolus of 100 μg prior to the procedure and underwent a continuous octreotide infusion of 100 μg/h for 24 h after the procedure. On the second day after embolization the patient developed flushing, tachycardia, hypotension, and dyspnea. An electrocardiogram revealed atrial flutter at 130 beats/min with non-specific ST changes. The patient’s symptoms and rhythm were thought to be secondary to an acute carcinoid crisis (possibly from tumor necrosis), and therefore, he was immediately treated with intravenous fluids, octreotide (continuous infusion at 100 μg/h), and cyproheptadine 8 mg orally three times daily. Serum serotonin level was 1104 ng/ml (normal = 50–220 ng/ml). A subsequent computed tomography scan of the chest was negative for pulmonary embolism. A transthoracic echocardiogram revealed thickened restricted tricuspid valve with severe tricuspid regurgitation, thickened pulmonary valve with severe pulmonary regurgitation, and a dilated hypertrophied right ventricle with severely depressed right ventricular ejection fraction (Fig. 1A). Pulmonary artery systolic pressure was 35 mmHg. Left ventricular size and systolic function were normal. Despite medical management with intravenous fluids and octreotide, the patient initially remained mildly hypotensive. Because right ventricular function was severely depressed, dobutamine and digoxin were administered. After four days on this regimen, the patient demonstrated a significant improvement in flushing, blood pressure, heart rate, and oxygen requirements. His dobutamine was discontinued. The patient reverted back to normal sinus rhythm with the initiation of amiodarone. A cardiothoracic surgery consultant recommended against tricuspid and pulmonary valve replacement at that time, with the possibility of a valve replacement in the future. Serotonin levels were monitored throughout the patient’s clinical course and showed progressive decline to 301 ng/ml. The decrease in serotonin levels correlated well with the patient’s improved clinical condition. A repeat echocardiogram 10 days later showed a significant improvement and normalization of right ventricular systolic function (Fig. 1B) and severe tricuspid regurgitation. The patient’s overall clinical condition continued to improve and he was discharged in stable condition. These findings suggest that the acute right ventricular dysfunction was secondary to acute carcinoid crisis and resolution resulted in a significant improvement of both right ventricular systolic function and clinical condition.
Carcinoid crisis is a life-threatening complication of carcinoid tumors. It is a rare event that may occur during induction of anesthesia, intra-operatively, during tumor manipulation, percutaneous fine needle biopsy, and chemo-embolization, but may also occur spontaneously. Carcinoid crisis is caused by the release of serotonin and other vasoactive peptides and may result in profound hypotension, hypertension, diarrhea, bronchoconstriction, flushing, and acidosis. Carcinoid crisis can be treated with somatostatin analogues, such as octreotide. Furthermore, cyproheptadine and corticosteroids have also demonstrated some efficacy in treating this condition. Octreotide has also been found to be useful in the prevention of carcinoid crisis and its prophylactic administration is recommended prior to any interventions. Even though our patient received prophylactic octreotide prior to hepatic artery embolization, he proceeded to develop carcinoid crisis. Additionally, despite medical management with octreotide, the patient remained mildly hypotensive during the initial phase of the carcinoid crisis. Due to the possibility that right heart failure was contributing to the patient’s condition, dobutamine and digoxin were added. It is important to note that these drugs are generally not recommended in an acute carcinoid crisis as they can have a deleterious effect due to their increased sympathetic activity. The patient’s condition did gradually improve correlating well with decrease in serotonin level. Due to the rarity of these tumors, complicated management decisions, and possibility of critical complications such as carcinoid crisis, this disease needs to be managed by experienced physicians.

Carcinoid heart disease occurs in two-thirds of patients with carcinoid syndrome. Cardiovascular complications are thought to be the result of serotonin and biogenic amines secreted into the hepatic vein by liver metastases. These include both structural lesions as well as hemodynamic alterations. Carcinoid cardiac lesions are plaque-like,
fibrous diffuse endocardial thickenings, composed of smooth muscle cells, myofibroblasts, and an overlying endothelial cell layer, that classically involves the right side of the heart. These lesions result in thickening, retraction, and immobilization of the tricuspid and pulmonary valve leaflets. Tricuspid regurgitation is the most common and nearly universal finding, although tricuspid stenosis can occur as well. In contrast to the tricuspid valve, the predominant pulmonic valve lesion is stenosis, although pulmonary regurgitation is also seen. These structural alterations may cause increased right atrial and right ventricular pressures with resultant right-sided heart failure. Rarely, left-sided valvular involvement may occur in patients with bronchial carcinoid tumors or patent foramen ovale.

Management of carcinoid heart disease can be complicated. Patients should be referred to physicians who are well experienced managing this clinical entity. It is important to obtain a baseline transthoracic echocardiogram in patients with carcinoid tumors to assess carcinoid heart disease. This was unfortunately not performed in our patient and should have been done prior to the patient undergoing hepatic artery embolization, as it would have provided insight into the patient’s baseline structural heart disease and hemodynamic complications. Medical therapies as well as surgical options are important to explore in patients with carcinoid heart disease. Patients with mild-to-moderate symptoms of chronic right heart failure can be treated with diuretics and digoxin. Somatostatin analogues are effective in the management of carcinoid syndrome, however, have not been shown to cause regression of cardiac lesions. Patients with intractable right heart failure from carcinoid heart disease have been considered for cardiac valve replacement. Some small studies in these patients have shown that cardiac valve replacement may improve symptoms. These studies, however, have also shown that valve replacement is associated with a significant perioperative morbidity and mortality. Factors associated with the progression of carcinoid heart disease have been poorly understood, however, a recent study has shown that a higher peak urinary 5-HIAA level and previous chemotherapy may be important adverse predictors in the progression of carcinoid heart disease.

We are unaware of any documented case of carcinoid crisis causing reversible right ventricular systolic dysfunction. We present this case for two reasons. First, to show that acute carcinoid crisis may cause a dramatic decrease in right ventricular systolic function, which may improve with treatment of the carcinoid crisis. Second, to illustrate that carcinoid crisis can be a life-threatening complication of carcinoid tumors and needs to be managed promptly, appropriately, and by well-experienced physicians.

References


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