

An incidental mass in the inferior vena cava discovered on echocardiogram

Timothy R Larsen, Kate Essad, Sachin Kumar Amruthlal Jain,
Mark Lebeis, Shukri David

ABSTRACT

Introduction: The differential diagnosis of an inferior vena cava (IVC) mass in an asymptomatic patient is broad and includes both thrombus and neoplastic etiologies. Once identified, new IVC masses should be further evaluated for possible malignancy. Up to 10% patients with renal cell carcinoma have direct extension of the tumor into the IVC, with 1% extending to the level of the right atrium. **Case Report:** A 73-year-old woman was referred for an elective two-dimensional echocardiogram after her cardiologist noted a new murmur. The patient was asymptomatic at that time. The echocardiogram revealed a mass in the IVC, two centimeters from the right atrium. Further work up revealed a large renal cell carcinoma. **Conclusion:** All imaging results should be

carefully reviewed for incidental evidence of previously undiagnosed disease. Malignant renal cell carcinoma is often first identified as an incidental mass on abdominal CT scan or ultrasound scan, It is exceedingly rare for a malignant renal cell carcinoma to initially present as an incidental mass on echocardiogram.

Keywords: Incidental IVC mass, renal cell carcinoma, IVC tumor extension

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Timothy R Larsen¹, Kate Essad², Sachin Kumar Amruthlal Jain³, Mark Lebeis⁴, Shukri David⁵

Affiliations: ¹Internal Medicine Resident, Department of Internal Medicine, Providence Hospital and Medical Center, Southfield, Michigan, USA; ²Medical Student, Department of Internal Medicine, Providence Hospital and Medical Center, Southfield, Michigan, USA; ³Cardiology Fellow, Department of Internal Medicine, Section of Cardiology, Providence Hospital and Medical Center, Southfield, Michigan, USA; ⁴Cardiologist, Department of Internal Medicine, Section of Cardiology, Providence Hospital and Medical Center, Southfield, Michigan, USA; ⁵Chief, Section of Cardiology, Department of internal medicine, Providence Hospital and Medical Center, Southfield, Michigan, USA.

Corresponding Author: Timothy Larsen, DO, Department of Internal Medicine, Providence Hospital and Medical Centers, 16001 West Nine Mile Road, Southfield, MI 48075; Ph: 248-849-3151; Fax No: 248-849-3230; Email: timothy.larsen@stjohn.org

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INTRODUCTION

Imaging studies frequently provide information above and beyond what is expected at the time of requisition. Unexpected diseases may be discovered prior to the development of symptoms and thus provide the opportunity for early diagnosis and intervention. Early treatment can often prevent or limit complications, including major morbidity and death. Koeneman et al. reported the prevalence of malignant renal tumors to be 0.2% in adults aged 50–79 years [1]. In many cases these tumors are discovered incidentally on imaging, usually by abdominal computed tomography (CT) scan or ultrasound scan [2]. The identification of a renal malignancy on routine echocardiography is exceedingly rare. Here we present a case where a large malignant neoplasm originating from

the right kidney was first identified as an incidental mass in the inferior vena cava on echocardiogram.

CASE REPORT

A 73-year-old female met with her cardiologist for a routine check-up. She was in her usual state of health; she denied dyspnea, chest pain, palpitations, syncope pre-syncope, shortness of breath, dysuria, and abdominal pain. All other review of systems was unremarkable. A new murmur was noted on physical examination, therefore a two-dimensional resting echocardiogram was done which revealed a mass in the inferior vena cava (IVC), two centimetres below the right atrium (Figure 1). The patient was admitted to the hospital for further evaluation. On admission her vital signs were: temperature - 36.4°C, respiratory rate - 20/min, pulse - 68/min, blood pressure - 134/69 mmHg, and BMI 40 Kg/m². Cardiac examination revealed a grade 2/6 crescendo-decrescendo murmur heard at the base that did not radiate, there were no gallops and point of maximal impulse was not displaced. The remainder of the physical exam was unremarkable. Laboratory analysis revealed hemoglobin of 10.8 g/dL and glomerular filtration rate of 42 mL/min. Rest of the laboratory investigations of CBC, electrolyte panel, urinalysis, thyroid function, and coagulation studies were within normal range. A CT scan of the chest and abdomen revealed a 10x13x15 cm mass arising from the anterior right kidney with direct extension into the suprarenal IVC (Figure 2). There was no evidence of distant metastasis. Pulmonary emboli (PE) were also

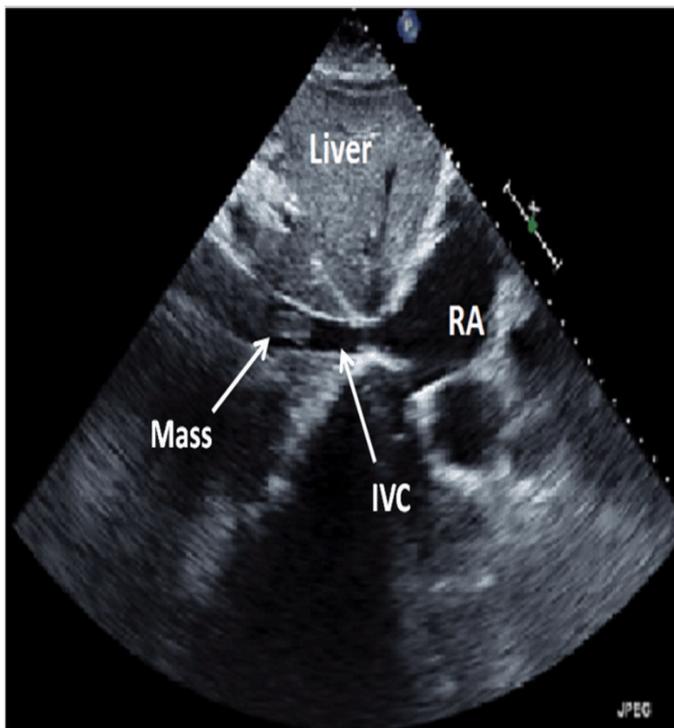


Figure 1: Two-dimensional echocardiogram showing a mass in the IVC two cm below the right atrium.



Figure 2: CT coronal image of the chest and abdomen in venous phase showing a 10x13x15 cm heterogeneous mass (white arrow) arising from the right kidney extending into the IVC (black arrow) (120 ml of Isovue-370 contrast, iv).

noted in the right main pulmonary artery and right middle arteries. Intravenous heparin therapy was initiated. After one month of anticoagulation, repeat CT scan demonstrated no interval change of the mass. Three months after presentation, the patient underwent right nephrectomy with excision of a 12.5x11.5x10.5 cm mass which was confirmed to be renal cell carcinoma (RCC) with extensive necrosis and hemorrhage. Vascular and cardiothoracic surgeons assisted in the resection of the 14.5 cm long, 1.2 cm diameter, polypoid portion that extended into the IVC and was adherent to the inner lining of the vein. The IVC was cross clamped, opened, and the mass was resected. The IVC was then flushed, the incision was closed, air removed, and the clamps released with restoration of blood flow. The patient is well and is on regular follow-up.

DISCUSSION

The differential diagnosis for an IVC mass includes: bland thrombus (most common), malignant thrombus, carcinoma (renal cell, hepatocellular, and adrenocortical), renal angiomyolipoma, pheochromocytoma, pseudolipoma, and primary intraluminal sarcoma [3]. A malignant etiology should be considered in all patients with a new IVC mass.

Renal cell carcinoma is associated with extension into the IVC in 4–10% of cases [4–6], with approximately 1% extending to the level of the right

atrium [5]. Up to 6% patients with direct extension into the IVC suffer pulmonary embolism which is a poor prognostic sign and is associated with a high rate of mortality [5].

Patients with RCC may present with microscopic hematuria, complaints of flank or abdominal pain and weight loss [4]. If a pulmonary embolism (PE) has occurred symptoms, typical of PE may present including dyspnea, pleuritic chest pain, hypotension, hemoptysis, and hypoxemia [7]. Dyspnea on exertion and syncope may present if the tumor extends to the level of the right atrium [8]. Serious complications of RCC with IVC and right atrium infiltration include massive PE, tricuspid valve obstruction, and Budd–Chiari syndrome [4]. This patient did not experience any of these associated symptoms.

Surgical intervention for RCC with IVC extension is the standard of care as complete surgical resection can potentially be curative [4]. Additionally, surgical intervention is required to prevent serious complications such as massive PE, tricuspid valve obstruction, and Budd–Chiari syndrome with resultant hepatic failure [4]. Operative technique is determined by the level of tumor extension following the Neves classification system (Table 1) [6]. The patient was Neves Level IV, thus warranting a multidisciplinary surgical approach including urological and cardiothoracic surgical evaluation. If the tumor had invaded the right atrium, cardiopulmonary bypass would have been recommended [6].

Table 1: Neves classification of renal tumor thrombus extension as adapted from Radak et al.

Level	Involvement
I	IVC at level of renal vein
II	Infrahepatic IVC
III	Retrohepatic IVC
IV	Supradiaphragmatic IVC or right atrium

Abbreviations: IVC - Inferior vena cava

CONCLUSION

This case is a unique example of an asymptomatic individual diagnosed with an advanced malignancy based on an echocardiographic abnormality and thus underscores the importance of careful and detailed review of all radiology investigations. The serendipitous discovery of this nephrogenic malignancy allowed for the initiation of potentially curative treatment before the development of serious complications including massive PE, tricuspid valve obstruction, and death.

Author Contributions

Timothy R Larsen – Substantial contributions to Conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Critical revision of the article, Final approval of the version to be published

Kate M Essad – Substantial contributions to Conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Critical revision of the article, Final approval of the version to be published

Sachin Kumar Amruthal Jain – Substantial contributions to Conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Critical revision of the article, Final approval of the version to be published

Mark Lebeis – Substantial contributions to Conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Critical revision of the article, Final approval of the version to be published

Shukri David – Substantial contributions to Conception and design, Acquisition of data, Drafting the article, Critical revision of the article, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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