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Computed Tomography of Cardiac Malignancies

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Computed Tomography of Cardiac Malignancies

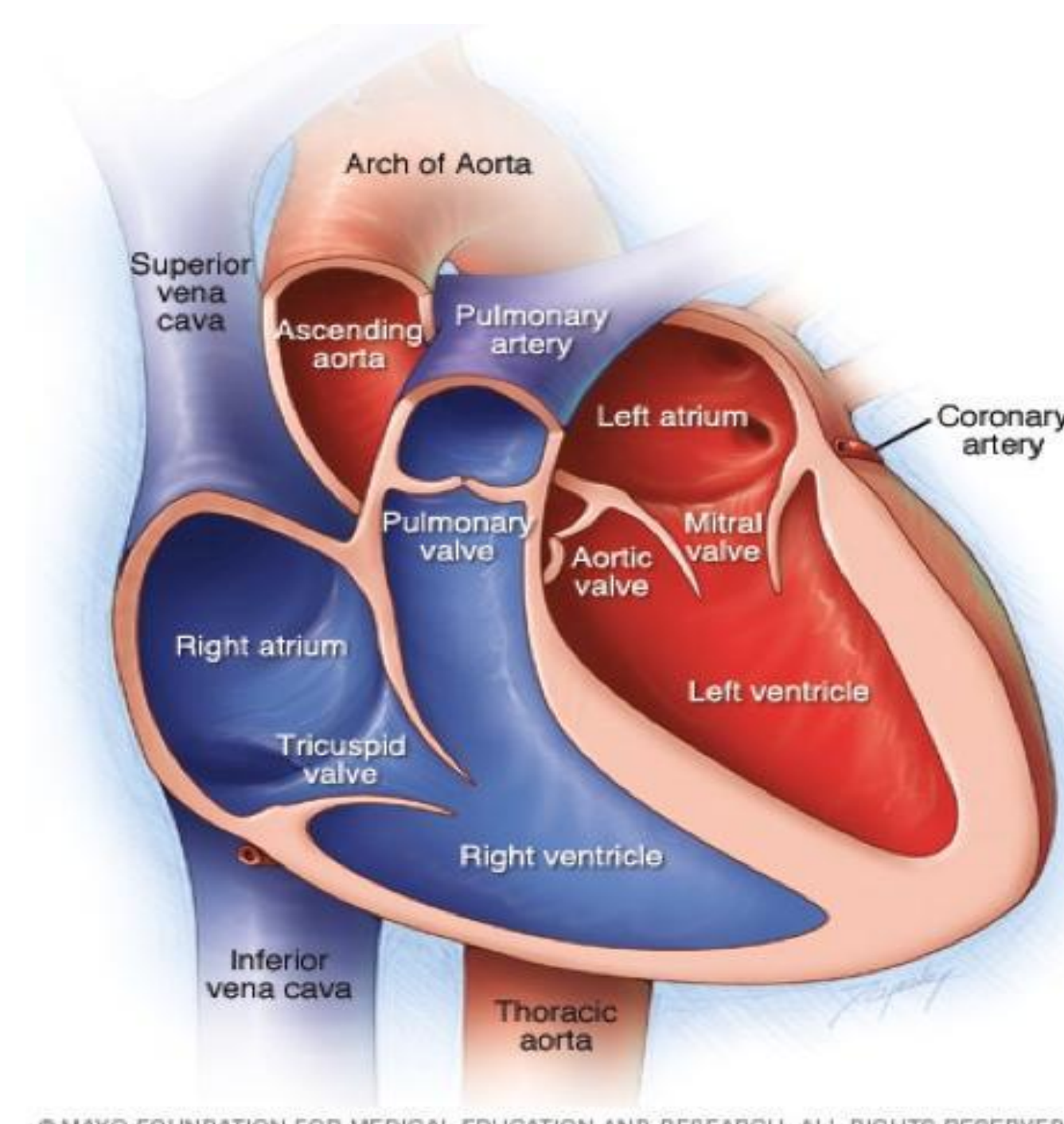
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Introduction

- A Cardiac Tumor is an abnormal growth of tissue in the heart that can be cancerous or noncancerous and either primary or secondary
- Cardiac tumors are extremely rare with an incidence of about 0.02% and about 10% develop into cardiac metastases (Casavecchia et.al, 2020)
- Medical experts have struggled to pinpoint and diagnose cardiac tumors until the introduction of “advanced medical imaging”. Cardiac tumors are commonly asymptomatic in early stages and are associated with short survival times, making diagnosis and treatment difficult (Furlow, 2016)
- Patients diagnosed with cardiac metastases usually die within one year: this is due to either late discovery of the tumor because of the lack of symptoms present or the spread of metastatic disease from multiple organs
- A patient's symptoms and prognosis depend on the location and the size of the tumor and how quickly the tumor is diagnosed and quickly treatment is begun
- Generally, right heart outflow obstruction can be shown by venous distention, ascites or swelling of lower extremities while left outflow obstruction can be shown by dyspnea, syncope or cardiogenic shock (Ogechukwu et al, 2019)

Heart Anatomy



(Mayo Clinic, 2020)

- The heart is composed of four chambers that help to supply blood to the entire body through delivery to arteries, capillaries and veins

Types of Cardiac Malignancies

- Cardiac tumors are usually divided into two types: benign and malignant

Benign tumors are

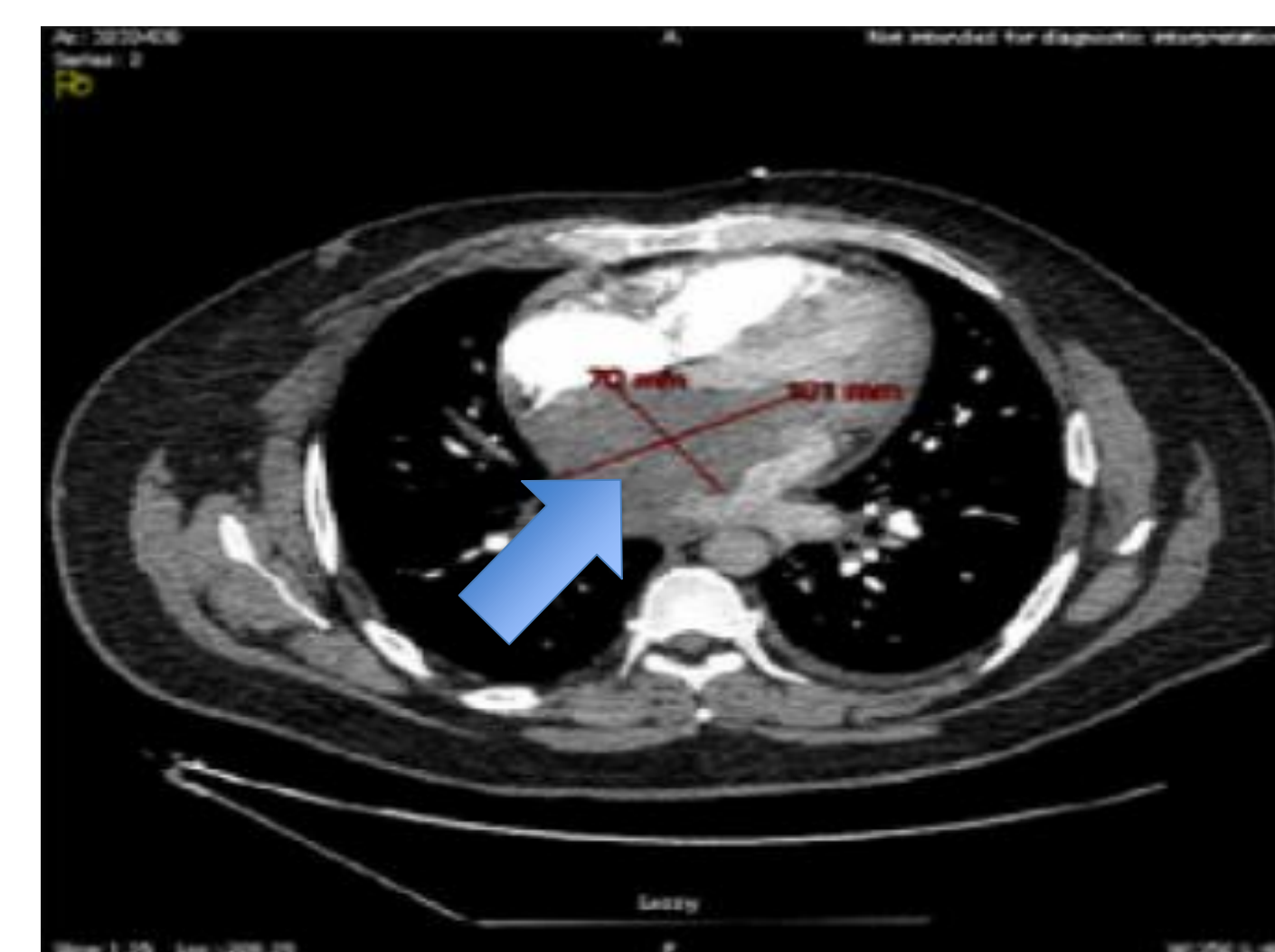
- More common than malignant tumors
- Typically smooth and lobular and arise from the endocardium of the left atrium in 75-90 percent of cases (Furlow, 2016)
- Possible symptoms presented are dyspnea, chest pain, syncope and heart palpitations
- The most common types are myxomas in adults and rhabdomyomas in children



Computed Tomography (CT) scan showing a cardiac myxoma in the endocardium of the left atrium (Radiopedia, 2020)

Malignant tumors are

- More deadly than benign tumors
- Visualized as large masses with multilobar contours, a broad base of attachment and origination in the right or left atrium or the pericardium (Furlow, 2016)
- The most common types are sarcomas and angiosarcomas are the most common type found in the heart
- Two types of angiosarcomas are either a well-defined mass that extends into a chamber of the heart or a diffuse infiltrating tumor along the pericardium (Furlow, 2016, p.535)



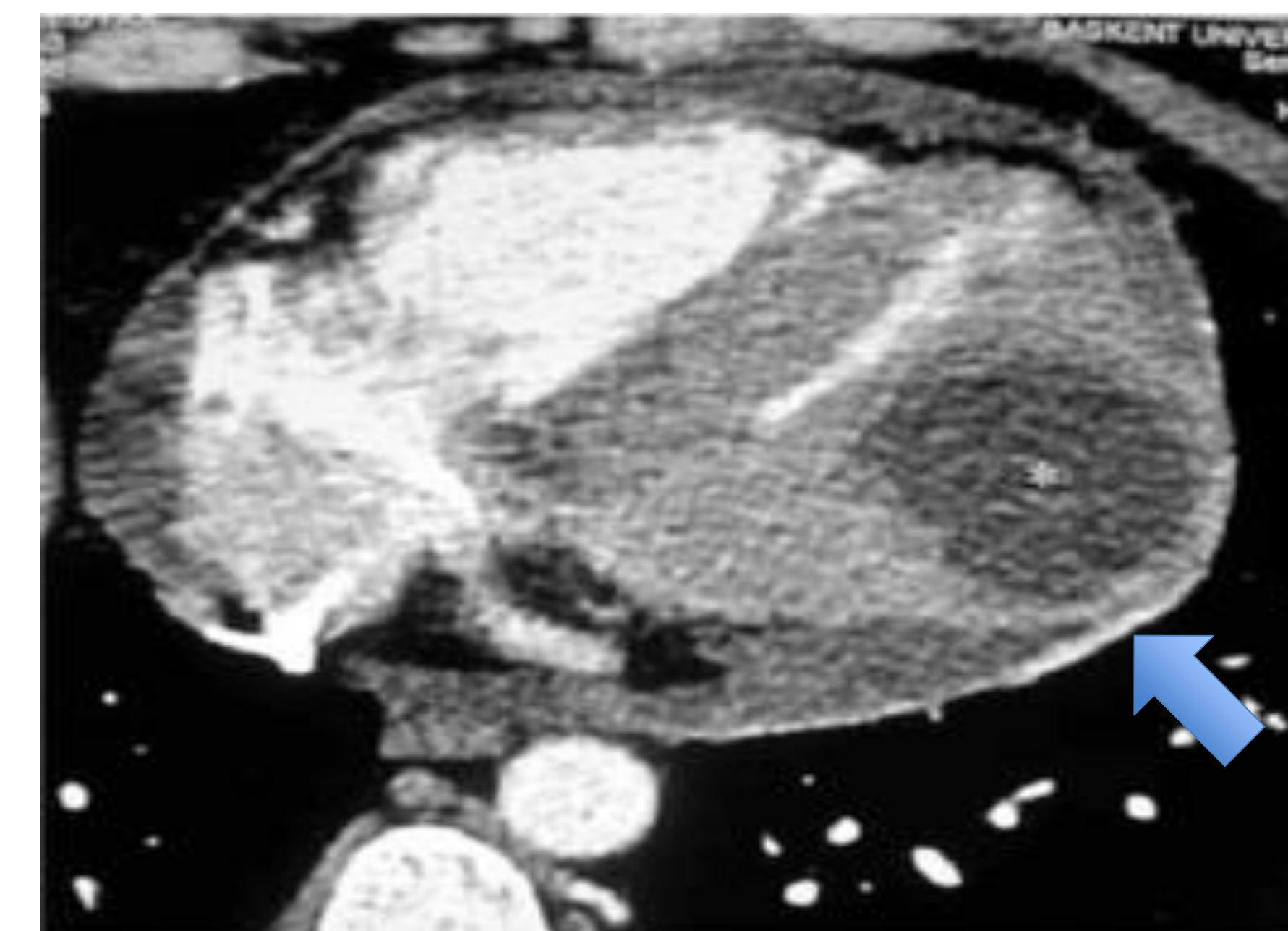
Computed Tomography (CT) scan showing a cardiac sarcoma in the left atrium on a 36-year-old male (Ogechukwu, 2019)

Why Computed Tomography?

- Computed Tomography provides a great deal of diagnostic information including functional assessment and characterization of tissue. It also helps to assess the presence of calcification and provides some soft tissue discrimination, helping to determine the degree of myocardial infarction (Casavecchia et.al, 2020)
- Excellent spatial resolution helps medical personnel determine if the tumor has metastasized (Furlow, p. 529)
- Electrocardiographic gating ensures that images are taken when the heart is in diastole to reduce motion artifact and improve image quality

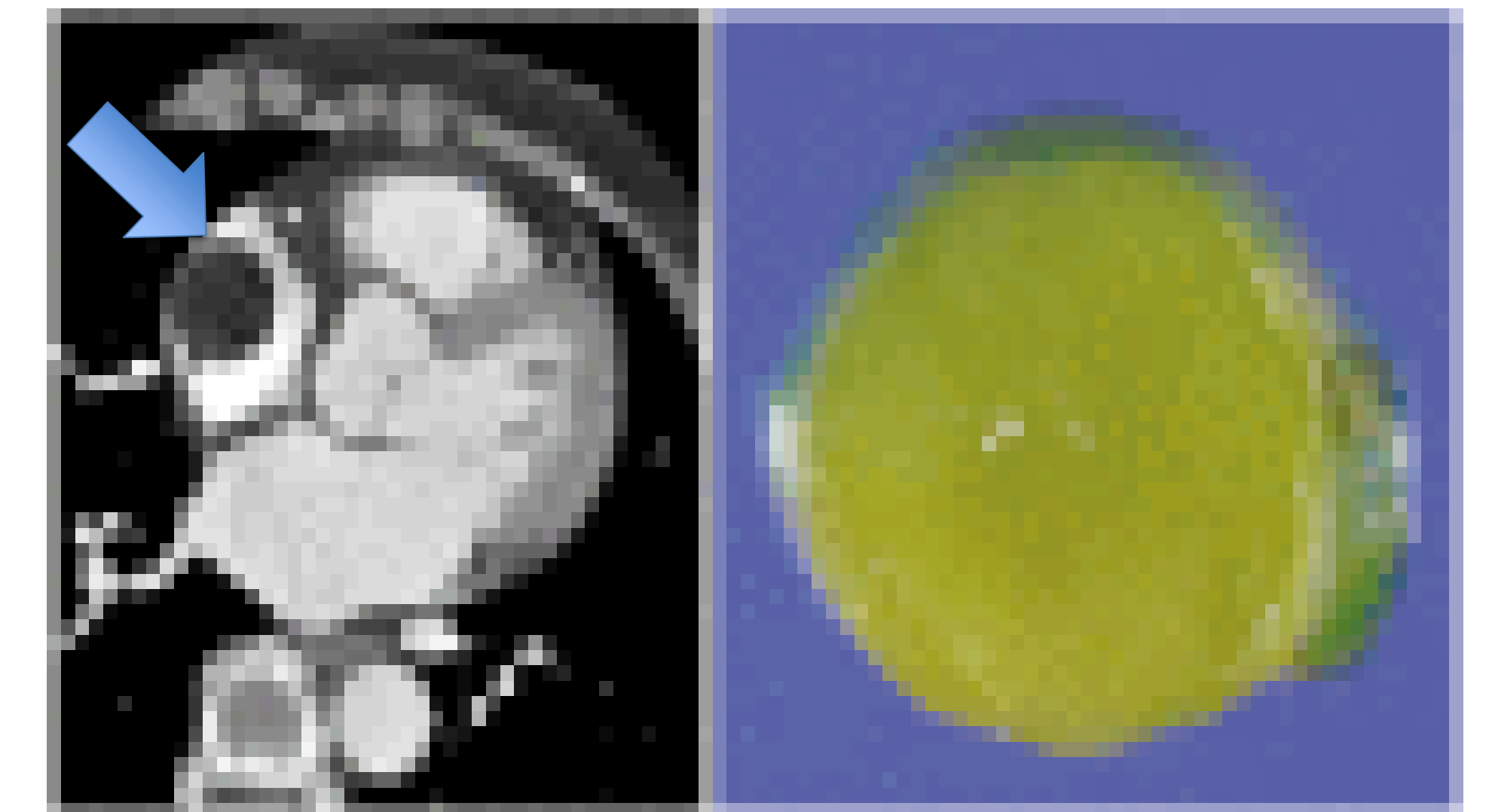
Role of CT in Diagnosis

- Due to its excellent image quality and modern technological advancements, CT is a great modality to evaluate cardiac masses



A ECG-Gated CT scan showing a cystic mass in the wall of the left ventricle (Sahin, 2020)

- Multi-Detector Computed Tomography has gained an advantage over echocardiography in its ability to “characteri(ze) fatty and calcified foci within tumors and a wide field of view for superior detection of metastatic disease” (Furlow, 2016, p.533)
- Three-dimensional reconstruction provides exceptional spatial resolution and allows the technologist to correct an imperfect scan. Scans without contrast media can show tumor calcification and demonstrate the stage of the tumor (Aggeli et al, 2020)
- The utilization of contrast can help to identify tumor vascularity and the volume of blood flow through the heart, helping to differentiate between benign and metastatic tumors
- CT findings of a mass smaller than 5cm usually indicate a benign tumor while a tumor larger or with multiple lesions is usually malignant (Furlow, 2016)

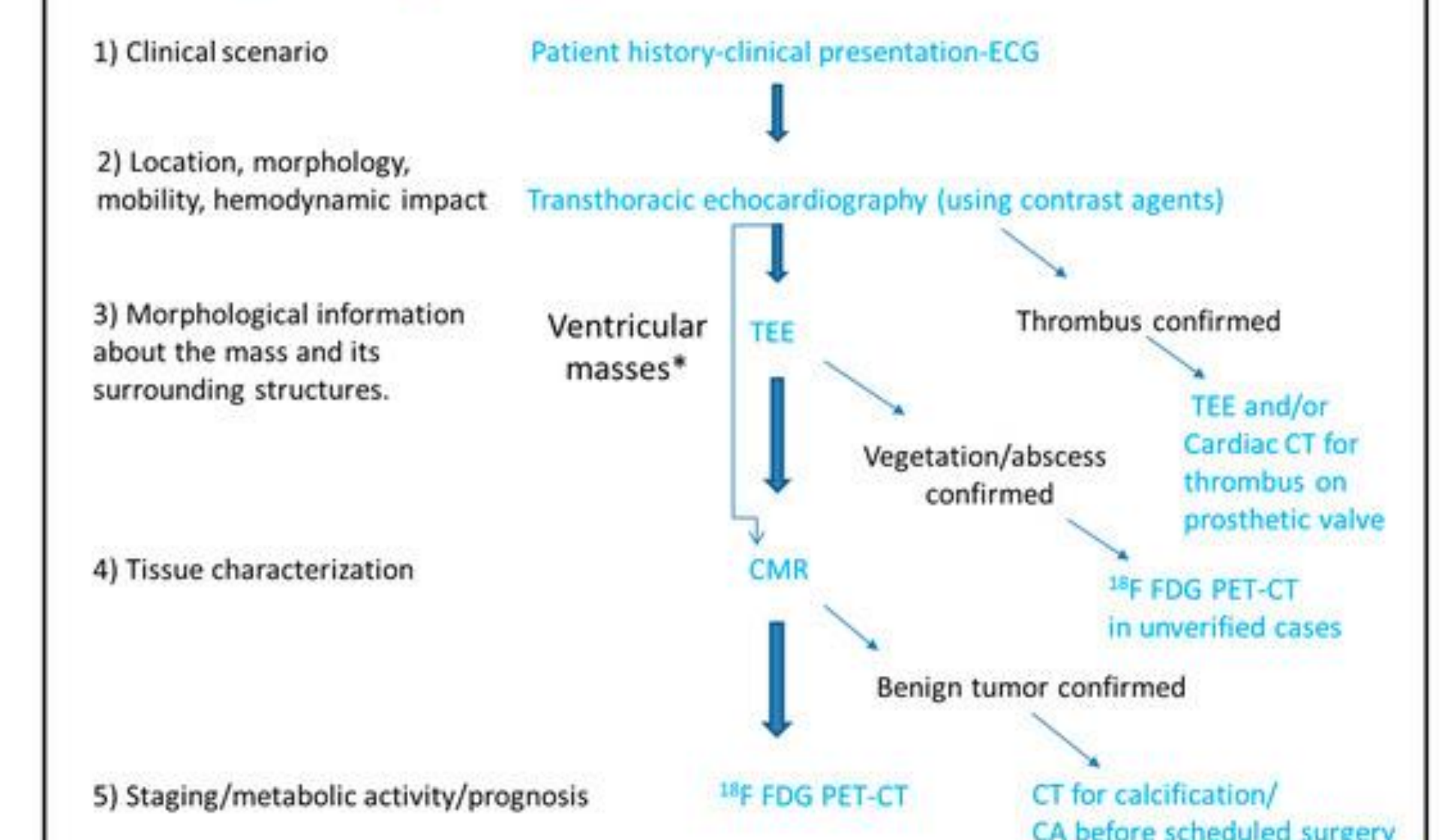


Lipoma of right atrium presented in a 62-year-old female and dissected lipoma after surgery (Kim et al, 2009)

Treatment

- Patients with metastatic tumors are not recommended to receive surgical resection, however, chemotherapy or radiation therapy may be suggested
- Volumetric CT image reconstructions can monitor a cardiac tumors response to treatment and help to show the probability of recurrence (Furlow, 2016)
- A study published by Bakaeen et al provided a median survival time of 24 months for 27 patients after they received surgical resection (Ogechukwu, 2019)

Stepwise diagnostic algorithm for evaluation of cardiac masses



A step-by-step diagnostic algorithm for treatment of cardiac masses (Aggeli et al, 2020)

Conclusion

Although rare, cardiac malignancies can be fatal, especially if diagnosis is delayed. There is no evidence base to help determine optimal imaging, diagnostic and treatment strategies due to the rarity of cardiac tumors. Computed Tomography is imperative for finding diagnostic, functional and anatomical information of cardiac malignancies. As further clinical studies of cardiac tumors are completed, medical personnel will gain the necessary information needed to create a universal, evidence-based practice.