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MALIGNANT TUMOR OVERVIEW

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Overview

Primary cardiac tumors are very unusual, with an autopsy incidence of 0.001 to 0.003%.[1] In practical terms, primary cardiac tumors are seen in about 1 in every 500 cardiac surgical cases. Of these tumors, about 75% are benign and 25% are malignant. Three-quarters (75%) of the malignant tumors are sarcomas, which will be the topic in our malignant primary cardiac tumor section.[2] This rarity leads to few institutions and even fewer individual surgeons having accumulated any substantial experience. Treated without surgical resection, the prognosis for primary cardiac sarcoma is dismal.

In a 2007 literature review spanning from 1973 to 2006, 117 cases of primary cardiac sarcoma were identified. In the most common group, angiosarcoma, the outcome without surgical resection and with medical therapy alone showed 90% of patients dead within 9 to 12 months.[3] The Mayo Clinic published their 32-year experience, during which 34 patients had surgery for primary cardiac sarcomas with a median survival time of 12 months.[4] A combined series from the Texas Heart Institute and the MD Anderson Cancer Center that spanned 26 years found 21 patients who had surgery for primary cardiac malignancy with a survival of 14% at 2 years.[5] These institutions and almost all others in the literature have grouped all primary cardiac sarcomas together for analysis. We have also used this approach in our earlier analysis,[6] where we looked at 27 surgical resections for primary cardiac sarcoma over a 16-year period using a multimodality approach, with a 1-year survival of 80.9% and a 2-year survival of 61.9%. In this article, we separate the primary cardiac sarcomas into groups based on anatomic location rather than histology, but continue to analyze the data as a single group. Our current experience includes 83 primary cardiac sarcomas, of which 55 underwent surgical resection.

Our increasing referral pattern for primary cardiac sarcoma, combined with this background information from the medical literature, led our group working with our colleagues at MD Anderson Cancer Center to engage in a systematic study of primary cardiac sarcoma in an effort to better define this deadly and difficult disease, establish therapies, and continue to improve outcomes for these often very young patients. We proposed a classification system based on anatomic location rather than cell type, as is often done, because we have found that histology does not greatly affect treatment or prognosis, whereas anatomic location does.[7, 8] Our classification system divides primary cardiac sarcoma into right heart sarcomas, left heart sarcomas, and pulmonary artery sarcomas,[9] and these are the categories we use in our discussions of these tumors to follow.

These tumors have no well-recognized predisposing factors, occur with an average presentation age of 40 years,[10] and have no sex predilection. Symptoms depend on the anatomic location and extent of the tumor. Clinical presentation is generally due to intracardiac obstruction to blood flow with heart failure symptoms, local invasion with pericardial effusion or arrthythmia, embolism, or systemic symptoms of dyspnea, fever, malaise, and/or weight loss.

Tumors of vascular origin, angiosarcomas, are most commonly seen, but bone, muscle, neurogenic, and soft tissue cell lines occur as primary cardiac sarcomas. In the series reported by Putnam, angiosarcoma occurred in 37% of cases, malignant fibrous histiocytoma in 24%, leiomyosarcoma in 9%, rhabdomyosarcoma in 7%, unclassified in 7%, and in another category 16% of the time.[5] Malignant fibrous hystiocytoma is a diagnosis less often used by our pathologists today, and a recent pathologic review of 24 of our cases showed angiosarcoma in 10 (42%), unclassified in 9 (37%), 3 synovial cell sarcomas, and 2 leiomyosarcomas.[11] We have found angiosarcoma to be the most frequent right

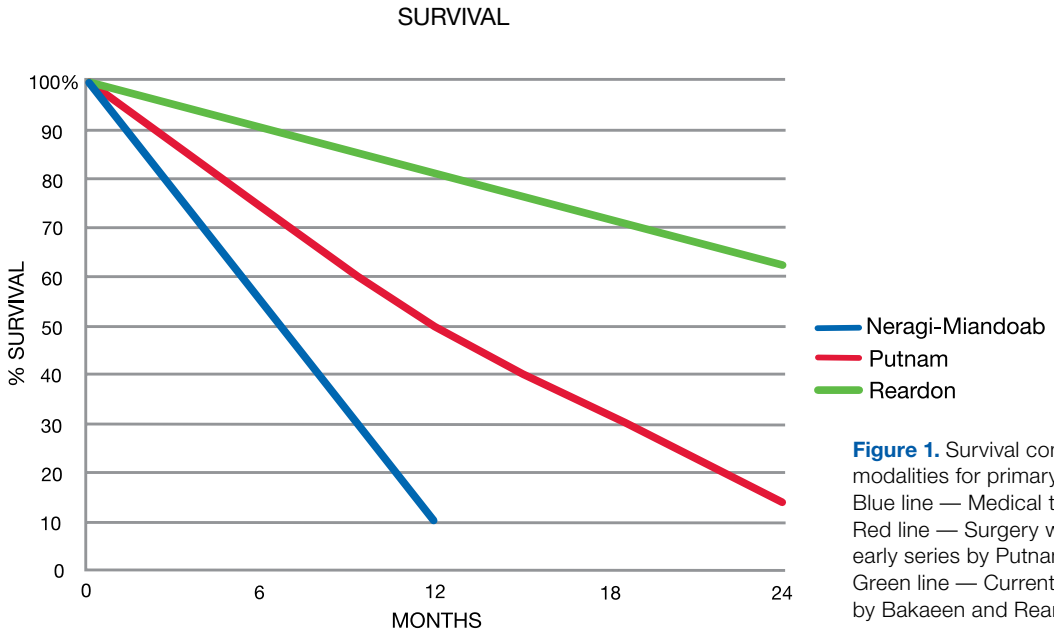

Figure 1. Survival comparison between treatment modalities for primary cardiac sarcoma.
Blue line — Medical therapy alone[3]
Red line — Surgery with some chemotherapy in early series by Putnam[5]
Green line — Current multimodality therapy series by Bakaeen and Reardon[6]

heart tumor, and unclassified, many of which were previously labeled malignant fibrous histiocytoma, to be the most frequent left heart sarcoma. Pulmonary artery sarcoma in our experience has a widely varied histology. Between 33%–80% of patients are reported to have metastatic disease on presentation.[11, 12] Gender, age and histologic type do not appear to be correlated with prognosis.[11, 13] Tumor grading, however, has generally been shown to correlate with prognosis. In all studies, surgical resection remains the mainstay of therapy and is vital for the hope of success.

Right heart sarcomas tend to metastasize early and are very bulky and infiltrative. Their bulk can occupy much of the right atrium but grows largely in an outward pattern, avoiding heart failure based on obstruction to flow until the very late stages of the disease. This usually allows the use of neoadjuvant chemotherapy with these tumors in an attempt to shrink the tumor bulk and sterilize the infiltrating edges, which increases the chance of obtaining a resection with microscopically negative margins for malignancy or an R0 resection for the patient. Because benign right heart tumors are less common than left-sided benign tumors and are often very large, we frequently see these tumors early before surgical resection has been attempted because of the suspicion of malignancy.

Left heart sarcomas tend to be more solid and less infiltrative than right heart sarcomas, and metastasize later in our experience. These are most often in the left atrium and tend to grow into the left atrium, obstructing blood flow and often presenting with significant and life-threatening heart failure. Neoadjuvant chemotherapy can be less often used because of this presentation. All left atrial sarcomas we have seen were first operated on elsewhere, with a presumed diagnosis of mxyoma, and grew back rapidly, most likely from incomplete resection before referral to our institution.

Pulmonary artery sarcomas tend to occur with multiple histologies, and almost always present with pulmonary artery obstruction and right heart failure with significant symptoms precluding neoadjuvant chemotherapy. They often resemble pulmonary emboli, which can delay proper diagnosis and treatment. Most have their origin just above the pulmonary valve; interestingly, they tend to progress distally inside of the pulmonary artery, rarely penetrating the artery wall itself. This deadly disease tends to strike young people who have young families, and they are often given little hope by the physician who initially sees them because of the aggressiveness of the disease and because so little is known about it.

Figure 1 shows a schematic view of the difference in survival from medical therapy alone,[3] to the survival in the early surgical series of Putnam from MD Anderson Cancer Center and the Texas Heart Institute,[5] to our last publication from the Methodist DeBakey Heart & Vascular Center and MD Anderson Cancer Center using a multimodality approach.[6] Although this remains a

difficult and deadly disease, progress has been and is being made. In the following articles, we will discuss in detail our experience with this disease, including current outcomes and improvements over past approaches, current treatment protocols, and our vision for future improvements.

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