is generally preferred because of a high recurrence rate of the tumor. Occasionally, however, as in our case, localization and extent of the tumor may challenge a total resection, in which case subtotal resection, palliative procedures, or even a cardiac transplant may be performed. We performed a partial tumor resection on the beating heart with the patient under CPB, which avoided the potential side effects of cardioplegic arrest, especially in the setting of a preoperatively compromised left ventricle. Although the tumor boundaries were very near of the coronary arteries, continuous hemodynamic monitoring on the beating heart provided an immediate control of the coronary artery and left ventricular compression and in consequence ensured a safe procedure. Because of the risk of an inadvertent perforation into the left ventricular cavity during tumor resection, we recommend left ventricular venting during the procedure.

In our view, surgical treatment is warranted for both symptomatic and asymptomatic cases of primary cardiac

fibromas because of the low odds of spontaneous regression and the otherwise high morbidity and mortality. An individualized surgical strategy should be planned for each case, with particular attention to the localization and extent of the tumor. Tumor resection on the beating heart by the institution of CPB may be advantageous in suitable cases.

References

1. Uzun O, Wilson DG, Vujanec GM, Parsons JM, De Giovanni JV. Cardiac tumors in children. *Orphanet J Rare Dis*. 2007;2:11.
2. Torimitsu S, Nemoto T, Wakayama M, Okubo Y, Yokose T, Kitahara K, et al. Literature survey on epidemiology and pathology of cardiac fibroma. *Eur J Med Res*. 2012;17:5.
3. Mecchia D, Lavezzi AM, Matturri L. Primary cardiac fibroma and cardiac conduction system alterations in a case of sudden death of a 4-month-old infant. *Open Cardiovasc Med J*. 2013;7:47-9.
4. Elahi M, Poh CL, Krishna A, Grant P. Surgical considerations for large asymptomatic cardiac fibromas in the context of fatal ventricular arrhythmias. *Heart Lung Circ*. 2012;21:750-3.
5. Yan XG, Jia B, Zhu BX, Hu XH. Successful resection of a primary cardiac fibroma in a neonate: report of a case. *Surg Today*. 2014;44:1768-70.

EDITORIAL COMMENTARY

On-pump beating heart surgery: A novel approach for urgent fibroma resection in an infant

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In this issue of the *Journal*, Yörüker and colleagues¹ describe the successful resection of a giant (3 × 5 cm) cardiac fibroma in a symptomatic 5-month-old infant using an on-pump beating heart technique. The rarity of these tumors in the pediatric population (0.01%),² is reason enough for a formal case report. However, the large tumor size, along with the clinical presentation of acute cardiac decompensation requiring rapid resuscitation and urgent surgical intervention, added further complexity. Furthermore, the adoption of the on-pump beating heart technique is a novel approach for urgent surgical intervention in a pediatric patient.

The use of cardiopulmonary bypass without cardioplegic arrest (ie, on-pump beating heart technique) during cardiac

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Central Message

Resection of a giant cardiac fibroma via the novel technique of on-pump beating heart surgery in an infant may have improved the outcome.

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surgery improves outcomes among high-risk adults undergoing urgent coronary artery revascularization after acute myocardial infarction.³⁻⁵ The hemodynamic instability related to cardiogenic shock after an acute coronary event in combination with the myocardial damage that is associated with cardioplegic arrest are thought to contribute to the increased morbidity and mortality of these high-risk patients.^{5,6} The on-pump beating heart technique avoids the well-known deleterious effects of cardioplegic arrest while providing the hemodynamic stability associated with cardiopulmonary bypass.¹ Furthermore, during coronary artery revascularization, on-pump beating-heart surgery optimizes coronary artery exposure by limiting extensive coronary artery retraction.⁵ Although it is reasonable to assume that the benefits of on-pump beating heart surgery would translate to pediatric patients, there are limited published data describing outcomes using this technique for children who require urgent intervention.

The child in this report, who presented in cardiac arrest with a giant tumor in the left ventricular posterior wall exerting mass effect on the left anterior descending and left main coronary arteries, may well be considered analogous to an unstable adult patient requiring urgent revascularization. The use of the on-pump beating heart technique offered the team several advantages. Specifically, avoiding cardioplegic arrest may have limited intraoperative hemodynamic instability related to compromised left ventricular function following cardiac arrest. Furthermore, given the close proximity of the tumor to the coronary arteries, the team benefited from continuous hemodynamic monitoring—and perhaps improved anatomic exposure—provided by a beating heart technique.

Unfortunately the limited follow-up of the patient to date leaves some unanswered questions, especially in the context of an exceedingly rare disease. For example, the association between residual tumor and long-term outcomes remains uncertain. In what is among the largest published series of surgical resections for cardiac fibroma there was no

significant change in the size of the residual tumor for 1 patient who underwent subtotal excision.⁷ Furthermore, although there is evidence that subtotal resection of ventricular fibroma may increase the late risk for developing cardiac arrhythmia,⁸ recent reports have demonstrated favorable results after subtotal excision.⁷ Additionally, the child described by Yörüker and colleagues¹ was found to have some residual impingement in the proximal left anterior descending coronary artery, which has unclear long-term clinical significance. It is impossible to know if a more complete resection could have been achieved had the patient undergone cardioplegia. Similarly, it is impossible to know how this child would have fared in the short-term if cardioplegia was undertaken. What is clear from this case is that a willingness to adopt a relatively novel technique from the adult population for urgent surgical intervention among pediatric patients can lead to successful outcomes.

References

1. Yörüker U, Yerebakan C, Mueller M, Akinturk H. Giant cardiac fibroma leading to cardiac arrest: surgical resection on beating heart. *J Thorac Cardiovasc Surg.* 2015;150:e83-5.
2. Nadas AS, Ellison RC. Cardiac tumors in infancy. *Am J Cardiol.* 1968;21:363-6.
3. Ferrari E, Stalder N, von Segesser LK. On-pump beating heart coronary surgery for high risk patients requiring emergency multiple coronary artery bypass grafting. *J Cardiothorac Surg.* 2008;3:38.
4. Zaroff JG, diTommaso DG, Barron HV. A risk model derived from the National Registry of Myocardial Infarction 2 database for predicting mortality after coronary artery bypass grafting during acute myocardial infarction. *Am J Cardiol.* 2002;90:1-4.
5. Miyahara K, Matsuura A, Takemura H, Saito S, Sawaki S, Yoshioka T, et al. On-pump beating-heart coronary artery bypass grafting after acute myocardial infarction has lower mortality and morbidity. *J Thorac Cardiovasc Surg.* 2008;135:521-6.
6. Varatharajah K, Rosenfeldt FL. Changes in noninfarcted myocardium explain benefits of on-pump beating-heart coronary artery bypass grafting for acute myocardial infarction. *J Thorac Cardiovasc Surg.* 2009;137:1575-6. author reply 6-7.
7. Cho JM, Danielson GK, Puga FJ, Dearani JA, McGregor CG, Tazelaar HD, et al. Surgical resection of ventricular cardiac fibromas: early and late results. *Ann Thorac Surg.* 2003;76:1929-34.
8. Ceithaml EL, Midgley FM, Perry LW, Dullum MK. Intramural ventricular fibroma in infancy: survival after partial excision in 2 patients. *Ann Thorac Surg.* 1990;50:471-2.