Finally, we agree that OPCAB does not require occlusion of coronary arteries during each anastomosis but disagree that the routine insertion of a shunt is the standard by which most cardiac centers practice OPCAB. There are concerns about the risk of coronary injury with the insertion of a shunt,³ particularly in the population of patients referred for coronary artery bypass grafting with poor-quality targets. Because this injury might also provoke regional inflammation and thrombosis, we have used shunts selectively for those with evidence of ischemia after brief coronary occlusion. Admittedly, this is an area that requires further analysis.

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References

1. Van Belle E, Susen S, Jude B, Bertrand ME. Drug-eluting stents: trading restenosis for thrombosis? *J Thromb Haemost*. 2007;5(suppl 1):238-45.
2. Raja SG, Dreyfus GD. Impact of off-pump coronary artery bypass surgery on postoperative bleeding: current best available evidence. *J Card Surg*. 2006;21:35-41.
3. Dygert JH, Thatté HS, Kumbhani DJ, Najjar SF, Treanor PR, Khuri SF. Intracoronary shunt-induced endothelial cell damage in porcine heart. *J Surg Res*. 2006;131:168-74.

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Minimally invasive implantation of a cardioverter in children

To the Editor:

We read with interest the case report of Snyder and coworkers¹ regarding the implantation of a cardioverter in a 3-year-old child with a minimally invasive approach. In this case the authors used a dual-coil shocking lead looped around the heart and fixed on the epicardium. The sensing electrode was set on the right ventricle, and the implantable cardioverter-defibrillator was secured in the left abdominal wall.

We fully agree with the authors that defibrillators should be considered more often in the pediatric population and that an epicardial approach is the only acceptable route in this population.² However, we have some concerns with their proposed approach. The looping coil might lead to progressive compression of epicardial vessels (coronary veins and even arteries) with the patient's growth and might further get dislodged or even break with growth. Breakage is prone to occur when the coil is readily fixed at different points (here by adhesions and suturing on the heart), and the risk is greater in a dual coil than in a simple one. Finally, devices set in the lower abdominal wall result in a large gap between electrodes, coils, and device with growth (much larger than when set in the thoracic cavity) and can induce abdominal complications.³

We have also developed an epicardial technique for this population in which the heart is set between the coil and the defibrillator, which acts as an active pole.⁴

The coil is positioned under the parietal pleura at the apex of the left thorax, and the defibrillator is positioned underneath the heart, within the diaphragm layers (between the aponeurosis and muscle). Sensing electrodes are positioned on the epicardium of the left ventricle (which has superior sensing parameters compared with the right ventricle) (Figure 1).⁵ The leads are looped in the left pleural cavity. Growth results in a progressive unlooping of the leads but without any tension on the heart and with minimal modification of the relationship between the coil and the defibrillator, which basically remain around the heart. Like the authors, we avoid a sternotomy. Change of an element of the defibrillator because of a structural failure (if any should occur with time) would not be a problem because of the absence of significant adhesions on the heart.

We have used this technique in 14 children with ages ranging from 2.9 to 13.2 years, with excellent sensing and defibrillation thresholds (successful defibrillation is usually achieved with 10 to 15 J). The Medtronic wireless communication system allows effective remote telemetry of the device (something not possible with any telemetric system). We have not seen any structural failure caused by somatic growth.

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Figure 1. Frontal and lateral chest radiographs of a 6-year-old boy with subpleural placement of the defibrillator electrode and intra-diaphragmatic position of the device.

References

1. Snyder CS, Lucas V, Young T, Darling R, Dalal G, Davis JE. Minimally invasive implantation of a cardioverter-defibrillator in a small patient. *J Thorac Cardiovasc Surg.* 2007;133(5):1375-6.
2. Aellig NC, Balmer C, Dodge-Khatami A, Rahn M, Pretre R, Bauersfeld U. Long-term follow-up after pacemaker implantation in neonates and infants. *Ann Thorac Surg.* 2007;83(4):1420-3.
3. Siclari F, Uhlschmid G, Zwicky P, Turina M. Intracolic migration of a pacemaker generator. *Thorac Cardiovasc Surg.* 1986;34(5):338-9.
4. Bauersfeld U, Tomaske M, Dodge-Khatami A, Rahn M, Kellenberger CJ, Pretre R. Initial experience with implantable cardioverter defibrillator systems using epicardial and pleural electrodes in pediatric patients. *Ann Thorac Surg.* 2007;84(1):303-5.
5. Dodge-Khatami A, Rahn M, Pretre R, Bauersfeld U. Dual chamber epicardial pacing for the failing atriopulmonary Fontan patient. *Ann Thorac Surg.* 2005;80(4):1440-4.

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The effect of ductal diameter on surgical and medical closure of patent ductus arteriosus in preterm neonates

To the Editor:

We read with interest the article by Tschuppert and colleagues¹ on the effect of ductal diameter on surgical and medical closure of patent ductus arteriosus (PDA) in preterm neonates. The question that the study aims to answer is quite relevant. Indeed, PDA is a common and potentially lethal condition in preterm neonates and is associated with significant comorbidities and resource use.² Tschuppert and colleagues¹ suggest that PDA size can be used to predict patients in whom medical management is likely to fail to achieve hemodynamic irrelevance. In particular, they suggest that patients with PDA areas of greater than 9 mm²/kg should be offered primary surgical closure at the time of diagnosis.

We think some comments are worth reporting on the study.

It is known that there is an inverse association between PDA size and the rate of closure after indomethacin administration in premature infants.³ As a consequence, a difference in PDA size between patients who do and those who do not respond to indomethacin would be expected. A surprising result of the present study is that the difference in PDA diameter in patients

who responded to medical treatment (2.4 ± 0.6 mm) and those who did not respond to medical management (2.8 ± 0.9 mm) was extremely low ($+16\%$ or 0.4 mm). Even if an average difference of 0.4 mm appears to be significant ($P = .006$) in statistical terms, we question how such a small difference can be clinically significant. This is particularly relevant because the difference in PDA size observed in the 2 groups largely overlaps with the reproducibility error for repeated measurements of similar cardiac structures by means of echocardiography.

Concerning the proposed 9 mm²/kg cutoff value, direct visual assessment of the figure provided suggests that no clear cutoff exists to discern patients who can be managed medically and those who will ultimately require surgical intervention. Accordingly, 19 (49%) of 39 reported patients with a PDA of larger than 9 mm²/kg actually responded to medical treatment alone and would have been erroneously sent to surgical intervention by using the proposed cutoff value. Also, 27 (17%) of the 162 patients with a PDA of smaller than 9 mm²/kg would be erroneously considered medically manageable, thus requiring delayed PDA surgical closure and longer intensive care unit stay.

Overall, we think the present study indicates that no clear cutoff exists to select patients who should undergo primary surgical PDA closure.

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References

1. Tschuppert S, Doell C, Arlettaz-Mieth R, Baenziger O, Rousson V, Balmer C, et al. The effect of ductal diameter on surgical and medical closure of patent ductus arteriosus in preterm neonates: size matters. *J Thorac Cardiovasc Surg.* 2008;135:78-82.
2. Gersony WM, Peckham GJ, Ellison RC, Miettinen OS, Nadas AS. Effects of indomethacin in premature infants with patent ductus arteriosus: results of a national collaborative study. *J Pediatr.* 1983;102:895-906.
3. Boo NY, Mohd-Amin I, Bilkis AA, Yong-Junina F. Predictors of failed closure of patent ductus arteriosus with indomethacin. *Singapore Med J.* 2006;47:763-8.

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Reply to the Editor:

In their letter Drs Giardini and Derrick summarize the statistical analysis and the findings of our article pertaining to the effect of ductal diameter in preterm babies as diagnosed by means of echocardiographic analysis and its relevance to the choice of therapy and success rate for patent ductus arteriosus (PDA) closure. They conclude that the current data do not indicate a clear cutoff value as to selecting patients for primary surgical PDA closure. I agree with their statement and am relieved that they read the article so carefully because no such pretence is stated anywhere in the text.

First, in the conclusions of the abstract, it is stated that medical treatment is a valid first option, but it is likely to fail with larger PDA diameters and lower birth dates. Furthermore, "hospital stay might be shortened by earlier surgical referral ... index greater than 9 mm²/kg."

In the conclusions of the Discussion section, it is repeated that medical treatment is the valid initial therapy in the absence of contraindications to medication and hemodynamic instability. "Patients with an index of greater than 9 mm²/kg would probably benefit from early direct surgical closure at the end of any given medical protocol...."

Statistical analysis of data, no matter how robust or clear-cut, which is not the case in the present study and is clearly acknowledged as such, cannot replace common sense and good clinical judgment. We have not introduced a new magical number by which a binary decision process should be made, thereby replacing medical treatment for PDA closure in preterm babies. Rather an index is presented, which can serve as a guideline to clinicians dealing with these patients to avoid undue delay in proposing and undertaking surgical PDA ligation.¹

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References

1. Tschuppert S, Doell C, Arlettaz-Mieth R, Baenziger O, Rousson V, Balmer C, et al. The effect of ductal diameter on surgical and medical closure of patent ductus arteriosus in preterm neonates: size matters. *J Thorac Cardiovasc Surg.* 2008;135:78-82.

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