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Editorial

Device Closure of Patent Ductus Arteriosus in Adults

Michael L. O'Byrne, MD, MSCE,[a,b,c] Christopher L. Smith, MD, PhD,[a] and Matthew J. Gillespie, MD[a]

[a] Division of Cardiology, The Children's Hospital of Philadelphia and Department of Pediatrics, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania, USA

[b] Center for Pediatric Clinical Effectiveness, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, USA

[c] Leonard Davis Institute and Center for Cardiovascular Outcomes, Quality, and Evaluative Research, University of Pennsylvania, Philadelphia, Pennsylvania, USA

See article by Wilson et al., pages 837-843 of this issue.

Patent ductus arteriosus (PDA) are essentially universally present at birth, although most close in the first few weeks of life. Persistence of PDA beyond this period occurs in between 2 and 4 per 1000 live births.[1,2] Surgical ligation of PDA was first performed by Gross and colleagues in 1939,[3] but the development of the Amplatzer Duct Occluder (Abbott, Santa Clara, CA [St. Jude Medical, St Paul, MN]) has allowed for device closure of PDA by interventional cardiologists with excellent technical success and minimal morbidity, supplanting operative ligation in all but the smallest patients. In recent years, interventional cardiologists have adapted existing technology and have demonstrated that PDA closure can be accomplished in even the smallest premature infants,[4-10] a trend that will likely accelerate with availability of the Piccolo PDA occluder (formerly referred to as the Amplatzer Duct Occluder II Additional Sizes). An initial case series describing the use of this device in older patients has been published,[11] and trial data of its use in premature infants are expected soon.

Limited Contemporary Data About PDA Closure in Adults

Even with some controversy regarding the utility of closing small-diameter PDA,[12-14] the vigilance of primary care physicians, combined with the ability to close PDA with minimal morbidity in the catheterization laboratory, has led to most PDA being treated well before patients reach adult age. Consequently, there is a dearth of information regarding PDA closure in older patients in the current era. In the largest series of PDA closure in practice from the United States **Im**proving **P**ediatric and **A**dult **C**ongenital **T**reatment (IMPACT) registry, 2.5% of cases were performed in adults.[13] Outcomes were excellent, with no reported cases of residual shunt or device embolization.[15] Compared with non-infant children, adult patients were more likely to have spontaneous bacterial endocarditis prophylaxis and pulmonary hypertension as indications for intervention, although left-ventricular volume overload remained the most common indication.[15] Though data from this large registry are helpful, they have provided limited insight into the specific technical concerns in adults. In addition, in its initial iteration, the registry does not contain data about outcomes after hospital discharge for any patients. In the last 10 years, several small case series of PDA closure in adults have been published,[16-18] but they also are limited by their relatively small individual size and lack of postprocedural follow-up.

PDA Closure in Adults: The Toronto Experience

In this current issue of the *Canadian Journal of Cardiology*, Wilson and colleagues report on a 17-year 161-patient experience of transcatheter PDA closure,[19] which is, to our knowledge, the largest series in the literature. It is an impressive experience for a single centre. The authors should be congratulated for carefully collecting patient-level data and using predefined definitions of left-ventricular volume overload and pulmonary hypertension, which helps the reader to understand their case mix. This allows readers to apply data from this series to their own practices with confidence. This is especially an improvement over the early experience with the IMPACT registry, in which discrepancies between measured hemodynamics and the reported indication for the procedure were common.[13]

The authors' experience is substantial, and their results are excellent. Consistent with studies in children,[15] technical success was achieved in almost all cases with small residual shunts in 2 of 161 cases (1.2%; 95% CI, 0.1%-4.4%). Moreover, because of their pooled experience, they can provide insights into closure that are useful for structural or congenital cardiologists for whom PDA closure in adult patients is relatively rare. For instance, with the exception of window-like PDA, they were able to use the first-generation Amplatzer Duct Occluder.

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Corresponding author: Dr Michael L. O'Byrne, Division of Cardiology, The Children's Hospital of Philadelphia, 3401 Civic Center Blvd, Philadelphia, Pennsylvania 19104, USA. Tel.: +1-215-5900-1790.

E-mail: obyrnem@email.chop.edu

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They also suggest "upsizing" the device relative to the package indications for use, which recommend selecting a device with a smallest diameter 2 mm greater than the smallest diameter of the duct. In smaller patients, there is pressure to use smaller devices and other shapes to avoid impingement or compression of surrounding vascular structures: specifically, compression of the roof of the left pulmonary artery (LPA) or extension of the larger diameter disk into the aorta. The authors' experience demonstrates that these conventional concerns are less of a concern in an adult-sized patient than inadvertently undersizing a device. This is especially true because PDA tissue has demonstrated the capacity to spasm during catheterization.[20]

Second, even in a series with a high prevalence of documented pulmonary hypertension (36% of cases), the authors were able to use the asymmetric first-generation Amplatzer Duct Occluder. Previous studies have advocated using a device that places discs on both sides of the duct to better secure it in cases of patients with pulmonary hypertension.[21] The authors do not report if any of their cases had severe elevation of pulmonary vascular resistance, but it may prove possible (with device oversizing) that a large pulmonary artery disc is not necessary.

Finally, the authors provide postprocedural follow-up (median: 2 months) with no episodes of late complications. They should be applauded for providing for their effort and transparency. There have not been reports of late complications, but providing this information (which is not in any other series to our knowledge) is helpful.

Collectively, the authors have detailed a unique experience, which represents a useful contribution to the structural and congenital interventional cardiology communities' knowledge about this procedure in this special population.

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Disclosures

Dr Gillespie is a consultant for Abbott and Medtronic. Both companies manufacture devices currently in use for PDA closure in small infants. Dr O'Byrne and Smith have no conflicts of interest to disclose.

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