alternative to surgery, and is associated with a long term reduction in blood pressure and LV hypertrophy.

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Closure of huge tubular patent ductus arteriosus using amplatzer vascular plug II or IV in premature infants and small children under 6 kg

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Background.— Percutaneous closure of huge and tubular (type C) patent ductus arteriosus remain challenging or unsuccessful in small infants.
Aim.— To evaluate the usefulness and safety of Amplatzer vascular plug II and IV for percutaneous closure of very large ductus arteriosus under 6 kg.
Methods.— Single-center retrospective study including all consecutive unselected patients ($\leq$6 kg, large symptomatic ductus arteriosus) referred to our institution over a 4 years period for percutaneous closure and treated with plug II or IV. No patient was excluded and there was no failure or surgery within the weight limit to consider percutaneous closure (> 2.5 kg).
Results.— Seven patients were successfully treated using vascular plug II and IV without any residual shunt. Six plug II were implanted (mean patients weight 4.3 $\pm$ 0.8 kg, mean ductus diameter 6 $\pm$ 1.8 mm, mean device size 8.6 mm (6—14), fluoroscopy time 14.8 $\pm$ 6.3 min, occlusion rate 100%, mean follow-up 6 $\pm$ 2 months) including huge type C (5) and one type E (1) ductus. Mean pulmonary artery pressure dropped from 25 $\pm$ 7 (17—38) mm of Hg to normal value in all cases and there was no aortic protrusion or embolization. One patient experienced severe but reversible pulmonary hypertension crisis in the catheter lab requiring blood transfusion. A 6 mm Amplatzer vascular plug IV was also implanted in a 4.2 kg patient (4.8 mm type D ductus, fluoroscopy 10 min, uneventful 8 months follow-up).
Conclusion.— Percutaneous closure of very large ductus arteriosus is safe and effective under 6 kg. In our experience, the vascular plug II profile allows with acceptable risk to extend indication to infants below 4 kg with huge tubular forms. This might contribute to reduce surgical indications and in hospital morbidities and to improve cost effectiveness. We believe that plug II could also be proposed in the near future for closure of conical shape (type A) with similar results.

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Relationship between fluoroscopic time, morphological parameters and irradiation during catheterization in children with congenital heart disease

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Background.— Cardiac catheterization procedures are being increasingly performed in children with congenital heart disease for diagnostic and treatment purposes. Given children's greater sensitivity to radiation and the longer life span during which radiation health effects can develop, the ALARA principle (irradiation As Low As Reasonably Achievable) is of peculiar importance. We report the radiation doses and related factors for children who underwent cardiac catheterization procedure in Toulouse children Hospital from January to April 2013.
Methods.— We prospectively included 60 children (mean age 4 years old, weight 2.350—59 kgs) undergoing a therapeutic (n = 55, 91.7%) or diagnostic (n = 5, 8.3%) cardiac catheterization procedures. We investigated the relationship between dose area product (DAP), fluoroscopic time (FT), pulsed fluoroscopic DAP, image acquisition DAP, age, morphological parameters and double products combining FT and weight or size or body mass index (BMI) or body surface area (BSA). BSA was calculated according to the Mosteller formula.
Results.— The mean DAP was 20,697 $\pm$ 29,342 mgycm^2. The mean total fluoroscopic time was 24.6 $\pm$ 19.7 min. DAP was not significantly different between diagnostic and therapeutic catheterization (P = 0.98). Although image acquisition DAP accounted for only 4.4 $\pm$ 2.4% of FT, it represented 42.5 $\pm$ 19.6% of DAP. DAP was moderately although significantly correlated with FT (r = 0.73, P < 0.0001), BSA (r = 0.44, P = 0.0011), age (r = 0.37, P = 0.0082), weight (r = 0.43, P = 0.002) and size (r = 0.38, P = 0.0052). DAP was strongly associated with FT $\times$ Weight (r = 0.92, P < 0.0001), FT $\times$ BSA (r = 0.93, P < 0.0001) and FT $\times$ Size (r = 0.91, P < 0.0001). Linear regression analysis model involving FT $\times$ BSA to predict DAP was significant (P < 0.0001). Approximately 90% of the variance of DSA was accounted for by this model.
Conclusion.— FT and morphological features (BSA, weight, size) are the key parameters associated with DAP. Peculiar attention to reduce FT and avoid unnecessary image acquisition may decrease irradiation during catheterization in children with congenital heart disease.

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Systematic description of cardiac phenotype based on the anatomical and clinical classification (ACC-CHD) in a DNA bank for congenital heart disease

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Background.— DNA banks containing samples of patients with congenital heart disease are being developed at international level. The accurate anatomic description of the cardiac phenotype of such samples is a key feature for their success.
Objective and methods.— To precisely describe the cardiac phenotype of the available samples of the ''CARREG'' DNA bank, started in April 2009 in our institution, based on the recently published clinical and anatomic classification (ACC-CHD) and the International Pediatric and Congenital Cardiac Code (IPCCC). Samples collected