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**Letter to the Editor**

# Closure of Small Patent Ductus Arteriosus by Occluding Detachable Coil

**Dear Editor,**

In 1971, non-surgical closure of patent ductus arteriosus (PDA) by Ivalon plug was described by Porstman et al.[1] More recently double umbrella occlusion has been extensively employed.[1,2,3,4] and percutaneous closure of PDA by detachable coil has become popular by most authors. Herein, we report on our experience in dealing with small PDA closure by occluding detachable coil.

From November 1999 to June 2001 overall 33 patients with the presumptive diagnosis of small PDA were included in this study by physical examination, two dimensional echocardiography and color flow imaging studies. They underwent cardiac catheterization for diagnosis and for occlusion of PDA by detachable coil. Inclusion criteria were small PDA (size <4mm), age above one year and exclusion criteria were presence of complex cardiac anomaly or systemic disorder.

The age of the patients ranged from one to 14 years (median of 4.5 years). Eight patients had associated cardiac anomalies: mitral valve prolapse and mild aortic regurgitation each observed in 2 (6%), valvular aortic stenosis, small ventricular septal defect, valvular pulmonary stenosis and mild mitral stenosis each in one patient (3%). Two patients had undergone balloon valvuloplasty for aortic valve and pulmonary valve stenosis previously.

Pulmonary /systemic flow ratio (QP/QS) measured at catheterization laboratory was 1.15-1.5 (mean = 1.3). The smallest internal diameter of the ductus ranged from 1.5 to 4 mm (average; 2.4mm).

The available occluder detachable coils (Cook William Cook Europe, a Cook Group Company Sandet 6 DK-4632 Bjaeverskov) of different sizes proportionate to ductal size were utilized. These coils are manufactured from stainless steel material with attached thrombogenic Dacron strands (TDS).

Successful implantation of detachable coil was performed in 32 patients, of whom, 27 (81%) underwent placement of one detachable coil, 3 (9%) had two and 2 (6%) had three coils.

Fourteen patients had PDA closure with the smallest available coil (IMWC -3- PDA -4). Six patients had closure with the mid-sized coil (IMWC-5-PDA-4 or 5-PDA-5).Eight patients received large sized PDA coil (IMWC-6.5-PDA-4).

Only one patient required retrieval of unsuccessful embolization of the coil into the left pulmonary artery. Complete closure was confirmed by aortography 10-15 minutes after the procedure in at least 20 patients. Small residual leak seen in 12 patients in post-implantation angiogram was not detectable on color flow imaging performed 24 hours later. Complete closure was confirmed in 6 after 7 days and in 3 patients up to one month later. Follow-up revealed two non-significant residual shunts that disappeared spontaneously in 6 months.

In one patient with significant residual shunt, hemolysis began 12 hours after coil implantation and was followed by acute tubular necrosis with creatinine rise. After surgical closure of the PDA and removal of the coil, hemolysis stopped and renal function returned to normal.

After one year of follow up, no patient had persistent residual leak requiring surgical or interventional procedure and none of the patients underwent additional catheterization.

An abundance of information related to appropriate techniques in PDA occlusion has recently been published. Long term evaluation has not been undertaken, but related complications such as device embolization have been rare.[4,5] We postulate that two major problems may be addressed by our procedure; first complex performance during the procedure of detachment that leads to unintentional misplacement or detachment of the coil, and secondly residual PDA leaking through a sharp coil border produced severe intravascular hemolysis that has also been reported by other authorities.[6] The long term incidence of residual PDA detected by color flow imaging was less than 5% after 6 months that is acceptable compared with the parallel studies.

## References

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