Multiple transcatheter ınterventions in the same session in congenital cardiopathies

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ABSTRACT

Background: To investigate the methods of percutaneous transcatheter interventions for combined congenital heart disease and to evaluate its efficacy in children. **Materials and Methods:** Thirty cases (ages 3 days-13.5 years, body weight 3-35 kg) that underwent two multiple transcatheter interventions for combined or solitary congenital heart disease were retrospectively analyzed and presented. **Results:** A total of 61 transcatheter interventions were performed in 30 patients as combined procedures. In 29 patients, two different procedures were combined in the same session, in remaining one patient, combination of three interventions were performed in the same catheter session. Interventions performed in combined procedures were as follows: Coarctation balloon angioplasty in 12 cases, pulmonary balloon valvuloplasty in 10, PDA coil embolization in 10, aortic balloon valvuloplasty in 8, VSD closure in 5, ASD closure in 4, ductal stent implantation in 4, palliative pulmonary balloon valvuloplasty in 3, recanalization and angioplasty of the systemic-pulmonary shunt in 2, balloon atrial septostomy in one, aortic coarctation stent implantation in one, coil embolization of a pulmonary lobar sequestration in one and pulmonary valve perforation plus pulmonary balloon valvuloplasty in one were performed as first or second procedure. There was no mortality or major morbidity in relation to combined procedures. **Conclusion:** Multiple transcatheter interventions in the same session are feasible, safe and effective with satisfactory good results. Second intervention may be performed as complementary procedure or independently to the first intervention.

Key words: Congenital cardiac defects, percutaneous procedures, percutaneous treatment

INTRODUCTION

Advances in pediatric interventional cardiac catheterization have changed the therapeutic strategy for many patients with congenital heart disease. Since the first attempt of palliation of transposition of the great arteries by transcatheter technique,[1] the efficiency and safety of transcatheter interventional treatment have been greatly improved. Nowadays, many congenital cardiac diseases can be treated by transcatheter interventional procedures.[2-4] Moreover for some congenital lesions, such as pulmonary valvular stenosis,[5] transcatheter therapy nearly replaced the surgery.

For combined congenital cardiovascular defects, the efficacy and safety of transcatheter interventional therapy has been a topic of increasing concern. By the late nineties, reports of an interventional procedure prior to surgery for combined defects emerged, but there are only a few case reports where multiple defects were addressed simultaneously by interventional procedures.[1]

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We present our experience of percutaneous transcatheter interventions for combined congenital heart diseases and discuss the efficacy and safety of these simultaneous procedures in children.

MATERIALS AND METHODS

From the years 2004-2010, a total of 30 children (15 boys, 15 girls) underwent combined transcatheter interventions for multiple congenital heart defects. After routine physical and radiological evaluation, transthoracic echocardiographic examination was performed to all patients using Vivid-3 (General Electric) machine with 3.5 and 5 MHz transducers. Diagnostic cardiac catheterization and all interventional procedures were performed under general anesthesia.

A total of 61 transcatheter interventions were performed in 30 patients as combined procedures. In 29 patients two different procedures were combined in the same session; in remaining one patient combination of three interventions were performed in the same catheter session. Interventions performed in combined procedures were as follows:

Balloon angioplasty for coarctation to 12 children, pulmonary balloon valvuloplasty to 12 patients, transcatheteter coil embolization to 10 children, aortic balloon valvuloplasty to eight patients, ventricular septal defect (VSD) closure to five patients, atrial septal defect (ASD) closure to four patients, ductal stent implantation to four patients, recanalization of occluded Blalock-Taussiq shunt in two children, perforation of the pulmonary valve in one child, coil embolization of pulmonary sequestration in one child, balloon atrial septostomy to one child, and stent implantation for coarctation of the aorta in one child.

For valvular stenosis, peak systolic pressure gradients and for aortic coarctation, peak-to-peak systolic pressure gradients were determined before and after valve dilatation and/or aortic coarctation angioplasty and stenting.

Because the whole defects are small, non-detachable Gianturco coils were used for coil embolization of the patent ductus arteriosus. According to the nature of the defect and to the accompanying disease coil implantation were performed from arterial or venous sides of the ductus arteriosus.

Defect occlusion for ASDs and VSDs were performed under transesophageal or transthoracic echocardiographic guidance. All children with implanted devices received intravenous heparin (100 IU/kg) and prophylactic antibiotics during the procedure. Antithrombotic dose of acetylsalicylic acid was prescribed to all children with device closure for 6 months.

Ductal stent implantation was performed transarterially with standard coronary type stent in patients with pulmonary atresia to access effective flow to the pulmonary tree. After implantation of stent to ductal location and being sure of effective pulmonary flow, retrograde pulmonary valve perforation with a guide-wire and then balloon valvuloplasty to perforated valve were performed in selected cases. Intravenous heparin and acetylsalicylic acid were used sequentially after stent implantation procedure.

Statistical evaluation

Differences among pre- and post-procedure in cases who performed balloon angioplasty for coarctation of aorta, aortic balloon valvuloplasty and pulmonary balloon valvuloplasty were analyzed separately with the Student's *t* test. *P*-values below 0.05 were considered statistically significant.

RESULTS

Study population

The mean age of our whole study population was 36.3 ± 48.1 months (4 days–13.5 years) and the mean body weight was 12.4 ± 9.8 kg (2.2-35 kg). Age, weight and diagnosis of the whole cases is shown in Table 1.

Procedural features

Coarctation balloon angioplasty was the most performed procedure in our study population, performed in 12 cases. Coarctation balloon angioplasty was performed as the former procedure in four cases, as the latter procedure in eight cases. Lesions were native in all cases [Table 2]. The mean age of these cases was 25.5 ± 48.9 months (2 days-11.5 years) and mean weight was 9.7±10.6 kg's (3-35 kg). The mean gradient across the lesion was 23.2 ± 13.2 mmHg (1-44 mmHg) before and 7.7 ± 4.2 mmHg (0-15 mmHg) after balloon angioplasty (*P*=0.001).

Pulmonary balloon valvuloplasty was performed as the former procedure in eight cases [Table 2]. The mean total transcatheter gradient across the pulmonary valve in the cases except in one who was performed palliative pulmonary valvuloplasty was 75.4 ± 28.7 mmHg (44-131 mmHg) before valvuloplasty and 14.1 ± 8.3 mmHg (7-30