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Original Article

Feasibility, Safety, and Efficacy of Percutaneous Atrial Septal Defect Closure in Infants

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ABSTRACT

Background: The experience with percutaneous closure of atrial septal defect (ASD) in infants is limited. We sought to determine the feasibility, safety and efficacy of this procedure in children weighing < 20 kg. **Methods:** Observational study of a cohort of children weighing < 20 kg undergoing percutaneous closure. Patients with right ventricular enlargement and evident symptoms were included. ANVISA approved devices were implanted under transesophageal echocardiography monitoring. Patients were evaluated 1, 3, 6 and 12 months after the procedure. **Results:** Eighty patients were treated between October 1997 and May 2012. Median age and weight were 4 years (1-12) and 13.5 kg (5-20), respectively, 20 patients had a genetic syndrome (25%) and 4 patients (5%) had an additional ASD. Only one patient required 2 devices. Two patients had associated defects that were treated in the same procedure (pulmonary valve stenosis and arteriovenous fistula). One patient developed total atrioventricular block during device implantation, solved spontaneously 36 hours after device removal, with no need for pacemaker implantation. This patient was successfully treated percutaneously 6 months later

RESUMO

Factibilidade, Segurança e Eficácia do Fechamento Percutâneo da Comunicação Interatrial em Crianças Pequenas

Introdução: A experiência com o fechamento percutâneo da comunicação interatrial (CIA) em crianças pequenas é limitada. Avaliamos a factibilidade, a segurança e a eficácia desse procedimento em crianças com peso < 20 kg. **Métodos:** Estudo descritivo observacional de uma coorte de crianças < 20 kg submetidas a tratamento percutâneo. Pacientes com dilatação ventricular direita e sintomas evidentes foram incluídos. Implantamos próteses aprovadas pela ANVISA, sob monitorização ecocardiográfica transesofágica. Os pacientes foram avaliados 1 mês, 3 meses, 6 meses e 12 meses após. **Resultados:** Entre outubro de 1997 e maio de 2012, 80 pacientes foram tratados. As medianas de idade e peso foram de 4 anos (1-12) e 13,5 kg (5-20), respectivamente, 20 pacientes apresentavam alguma síndrome genética (25%) e 4 pacientes (5%) apresentavam CIA adicional. Somente um paciente necessitou duas próteses. Dois pacientes tinham defeitos

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without complications. Seventy-nine patients were discharged within 24 hours after the procedure. A mild residual shunt (1-2 mm) was observed in 5% of the cases before discharge. There was no residual shunt 6 months after the procedure. There were no complications in the late follow-up. **Conclusions:** Percutaneous ASD closure in selected symptomatic infants is a feasible, safe and effective alternative and should be the first option therapy.

DESCRIPTORS: Heart septal defects, atrial. Prostheses and implants. Child.

associados, os quais foram tratados no mesmo procedimento (estenose pulmonar valvar e fístula arteriovenosa). Um paciente desenvolveu bloqueio atrioventricular total durante o implante da prótese, resolvido espontaneamente 36 horas após a remoção da prótese, sem necessidade de implante de marca-passo. Esse paciente foi tratado percutaneamente 6 meses após com sucesso, sem complicações. Setenta e nove pacientes receberam alta hospitalar em até 24 horas após o procedimento. Fluxo residual discreto (1-2 mm) foi observado em 5% dos casos antes da alta. Após 6 meses de seguimento, não foi detectado fluxo residual. Não houve complicações tardias no seguimento. **Conclusões:** O fechamento percutâneo da CIA em crianças pequenas selecionadas e sintomáticas é uma alternativa terapêutica factível, segura e eficaz, devendo ser a primeira opção para seu tratamento.

DESCRITORES: Comunicação interatrial. Próteses e implantes. Criança.

The first description of interatrial septal defects dates back to 1875 and was performed by Rokitansky, but their physiopathology and clinical picture started to be revealed only after 1941.[1] *Ostium secundum* atrial septal defect (ASD) has the fourth or fifth highest incidence of congenital heart diseases, corresponding to approximately 5% to 10% of cases.[2-4]

With the gradual decrease in pulmonary vascular resistance, and improved hypertrophy and right ventricular compliance within the first year of life, ASD begins to have hemodynamic consequences with right chamber volume overload. However, most of these patients remain asymptomatic during the first years of life. The defect is usually electively corrected before the child reaches school age, at around 5 years old. Occasionally, patients younger than 5 years with ASD develop isolated symptoms generated by pulmonary hyperflow, including recurrent respiratory infections, bronchospasm, congestive heart failure, or failure to thrive.[5,6] This scenario is aggravated when the ASD is associated with prematurity, chronic pulmonary diseases (asthma, bronchodysplasia), genetic syndromes, or other systemic diseases (renal and liver failure, among others). These patients require early treatment.

The surgical approach was considered the method of choice for ASD management for over four decades. Although it has very good results,[7,8] it requires cardiopulmonary bypass, hemotherapy, and longer hospital stay, in addition to some postoperative morbidity, such as pain, infections, pericardial effusion, arrhythmias, and sternotomy scars.[9-11] The first percutaneous ASD closure was described in 1976.[12] With the technical advances and surgeons' greater experience, percutaneous treatment has become the modality of choice for the management of most patients with ASD.[13-19] Surgery is reserved for cases with unfavorable anatomy for the percutaneous approach, associated cardiac anomalies, or other types of ASD (e.g. *ostium primum* ASD, sinus venosus, and coronary sinus).[19] Although the percutaneous treatment is well established for older children, adolescents, and adults, there are few reports on the use of this method in small children.[20-24]

This article describes an experience with the percutaneous treatment of ASD in children weighing < 20 kg, assessing its feasibility, efficacy, and safety.

METHODS

Study design

Observational, longitudinal descriptive study of a cohort of children weighing < 20 kg submitted to percutaneous closure of *ostium secundum* ASD in two cardiology referral centers in Brazil. Data collection was performed retrospectively, through medical record analysis. Demographic, clinical, echocardiographic, and hemodynamic data were collected. Parents or guardians of patients were informed of the procedure and signed an informed consent approved by the ethics and research committee of both institutions.

Inclusion criteria

Children weighing < 20 kg with clinical and echocardiographic diagnosis of *ostium secundum* ASD with hemodynamic consequences, characterized by right ventricular volume overload associated with one or more of the following diagnoses:

– congestive heart failure;

– recurrent respiratory infections (six or more episodes in 12 months);

– chronic pulmonary disease (e.g. pulmonary bronchodysplasia, asthma, etc.).