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BALLOON ATRIAL SEPTOSTOMY UNDER ECHOCARDIOGRAPHIC GUIDANCE*

Case Report

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A seven-days-old male neonate was transferred to our institution in critically ill condition. Echocardiographic (ECHO) examination revealed the transposition of the great arteries (TGA) with a small ventricular septal defect. In the laboratory examination, arterial oxygen saturation was 29 percent and pH was 7.16. The poor condition of the neonate led us to decide to perform an immediate bedside balloon atrial septostomy (BAS) in the intensive care unit (ICU) with ECHO guidance. The umbilical vein was cannulated with a 5 Fr. Miller BAS catheter. Four balloon passes were performed resulting in large atrial septal defect. After the procedure, arterial oxygen saturation was measured at 40 percent. In TGA, the baby may present with severe hypoxia and may need management in the ICU. Emergency BAS may improve the clinical condition of the patient. Transferring the baby, who is mechanically ventilated (and is in openbed), to the catheterization laboratory takes time and can be harmful for him, and carries risk of extubation and heat loss.

The limitations of transthoracic ECHO guidance of BAS include the possibility of a poor ECHO window in an ill neonate on assisted ventilation and possible interference with maneuverability for both echocardiographer and catheter operator. It also carries the risk of contamination of the sterile field. When the advantages and disadvantages of transthoracic ECHO guidence are considered, transferring the baby to the catheterization laboratory can cause problems and time loss. Thus, ECHO-guided BAS at bedside is an efficient and good alternative. The transumbilical approach may be easier in the first few days of life. *Key words: balloon atrial septostomy, echocardiography.*

Balloon atrial septostomy (BAS) is a standard palliative procedure to improve intracardiac blood mixing in neonates with transposition of the great arteries[1]. It has traditionally been performed in the cardiac catheterization laboratory under fluoroscopic guidance[2,3]. The cross-sectional echocardiography (ECHO) has been used to help position the balloon catheter during the procedure. The advantages given for this method are the increased speed in performing the procedure, the reduced risk of trauma to atrioventricular valves and other vital

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structures, and the reduced exposure to radiation[4,5]. The procedure has been performed only with echocardiographic guidance, especially in the critically ill neonates in the intensive care unit (ICU)[2,3,5,6].

Case Report

A seven-day-old male neonate weighing 2000 g was transferred to our institution in critically ill condition. The patient was accepted to the ICU for evaluation of the cyanosis. In the physical examination, tachypnea, intercostal retractions and 2/6 systolic murmurs in the left sternal border were noted.

Echocardiographic examination revealed transposition of the great arteries with three mm ventricular septal defect in the midtrabecular interventricular septum and a small patent ductus arteriosus. There was a bidirectional shunt through the ventricular septal defect. There was no interatrial septal defect or shunt. In the laboratory examination arterial oxygen saturation was 29 percent and pH was 7.16.

The neonate was immediately placed on an infusion of prostaglandin E_1, but no improvement in oxygen status or acidosis was noted. After the placement arterial cut-down, the maximal arterial pressure was measured as 35 mmHg and the patient was then entubated. Because of the reduction of the urinary output a peritoneal dialysis was placed. The poor condition of the neonate led us to decide to perform an immediate bedside balloon atrial septostomy in the ICU with echocardiographic guidance. The umbilical vein was cannulated with a 5 Fr. Miller septostomy catheter. It was advanced to the left atrium through ductus venosus, right atrium and foramen ovale. Four balloon passes were performed resulting in an atrial septal defect of five mm with unrestrictive left-to-right shunt (Figs. 1 and 2). After the procedure, arterial oxygen saturation was measured at 40 percent. In spite of intensive care and treatment, the baby died after 10 hours.

Fig. 1: Subcostal view showing the adequate size of interatrial communication.

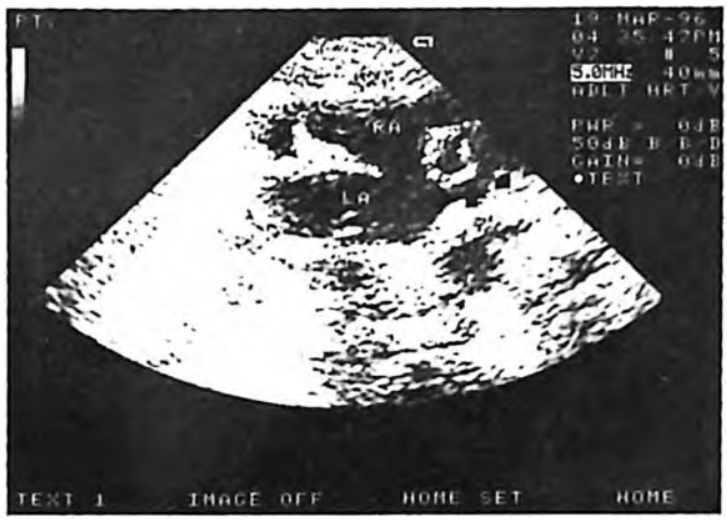

Fig. 2: Subcostal view showing the balloon that is being pulled from the left atrium to the right atrium.

Discussion

Balloon atrial septostomy (BAS) has been traditionally performed under fluoroscopic guidance, but the use of two-dimensional echocardiography is a method that augments the safety of the procedure[7]. The advantages of this method can be listed as fllows: it increases the speed of the procedure, reduces risk of trauma to atrioventricular valves and other vital structures, and reduces exposure to radiation[1, 2, 4, 5, 7, 8]. Two-dimensional echocardiography also enables the operator to directly assess the adequacy of the septostomy by measuring the diameter of the interatrial communication[5, 8].

Because of restrictive interatrial communication, the baby may present with severe hypoxia and acidosis and may need management in the ICU. In spite of beginning prostaglandin infusion and medical therapy for the acidosis, the hypoxemia may not improve. Emergency BAS may improve the clinical condition of the patient, with augmented mixing of the saturated and unsaturated blood[3]. Transferring the baby, who is mechanically ventilated (and is in openbed), to the catheterization laboratory takes time and can be harmful for him, and carries risks of extubation and heat loss[2, 4]. BAS has been performed recently in such babies with only ECHO guidance. This method is also effective and is less time consuming under these circumstances[4]. Thus, we decided to perform BAS in our patilent in the ICU because of his poor clinical condition.

When the femoral vein is used (in patients older than three days of age), it is possible to insert a sheath, change the catheters through it and measure the pressures and oxygen saturation after the procedure. However, it may be difficult to find a femoral vein in a neonate, thus consuming time, and it also removes the usage of the femoral vein for other invasive procedures[9]. Furthermore, in the first few days of life, because of the incomplete closure of the ductus venosus,

the transumbilical approach is a good alternative[1,9]. When the umbilical vein is used as the site of entry, the control of the pressures and oxygen saturation is not possible after BAS.

The occurrence of iliac vein or inferior vena cava thrombosis following BAS via the femoral vein is not a rare complication[1]. The umbilical venous approach may be complicated by the dislodging of a thrombus through the ductus venosus to the circulation[7].

The limitations of transthoracic ECHO guidance of BAS include the possibility of a poor ECHO window in an ill neonate on assisted ventilation and posible interference with maneuverability for both echocardiographer or catheter operator. In babies in the ICU, there was the risk of contamination of the sterile field because of the difficulties in maneuverability[10].

When the advantages and disadvantages of transthoracic ECHO guidance are considered, transferring the baby to the catheterization laboratory can cause problems and time loss. Thus, ECHO-guided BAS at bedside is an efficient and good alternative. The transumbilical approach may be easier in the first few days of life.

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