Balloon Atrial Septostomy at Queen Sirikit National Institute of Child Health in the Year 2001

CHAISIT SANGTAWESIN, MD*,
THAWATCHAI KIRAWITAYA, MD*,
CHANISA INTASORN, BSc*,
SOMPUN GLUNDEEMA, BSc*
THANARAT LAYANGKOOL, MD*,
AMORNRAT PETCHDAMRONGSAKUL, BSc*,
PUTTHA NOISAENG, BSc*,

Abstract

Background : Balloon atrial septostomy (BAS) is a safe and effective palliative procedure for patients with cyanotic congenital heart disease. The first BAS in Thailand was performed in 1987 at our institute and there have been many changes since that time.

Objective : To evaluate the immediate and intermediate outcomes of BAS in the new century.

Patients and Method : Thirty patients who underwent BAS from January to December 2001 were included in this study. Epidemiologic data, echocardiographic diagnosis, changing techniques from the previous report and the clinical course for patients were reviewed. The end point of follow-up for this study was December 2002.

Results : Thirty patients underwent BAS from January to December 2001 with an age range from 1 to 213 days (mean 30.40 $\pm$ 41.97 days). BAS was selectively tried *via* the umbilical vein in 6 cases. This was successful in 4 cases. Others were performed successfully *via* the femoral vein. The most common diagnoses were complete transposition of the great arteries (TGA), pulmonary atresia (PA) with intact ventricular septumand transposition of the great arteries with ventricular septal defect (TGA, VSD) respectively. No immediate complications were found in the present study. There were 5 deaths prior to surgery and 2 post-operative deaths accounting for a total mortality of 23.3 per cent.

Conclusion : BAS is a safe and effective palliative procedure for patients with various types of cyanotic congenital heart disease even in infants up to 7 months of age. The umbilical venous route can be used effectively without significant problems. Although the overall mortality is high, it is not related to BAS.

Key word : Balloon Atrial Septostomy, Queen Sirikit National Institute of Child Health, 2001

SANGTAWESIN C, LAYANGKOOL T, KIRAWITAYA T, et al
J Med Assoc Thai 2003; 86 (Suppl 3): S517-S521

* Pediatric Cardiology Unit, Queen Sirikit National Institute of Child Health, Bangkok 10400, Thailand.

Balloon atrial septostomy (BAS) has been a safe and effective palliative procedure for neonates with cyanotic congenital heart disease since 1966[1]. The first BAS in Thailand was performed in 1987 at our Institute[2] and since then the authors have extended the procedure for older infants with good short-term success[3]. Fourteen years after the first successful BAS for complete transposition of the great arteries (TGA), it is possible to review the procedure and evaluate the immediate and mid-term results of the procedure in this new century.

Objective

To evaluate the immediate and intermediate outcomes of BAS at our institute in this new century.

PATIENTS AND METHOD

Patients who underwent BAS from January to December 2001 were included in the present study. The procedure was performed using the standard method with an echocardiographic guide except for the intravenous access since the authors used the umbilical vein as the primary route in neonates less than 72 hours of age. Trials of this route took no longer than a few seconds so as to not prolong the procedure beyond that for the standard procedure. The epidemiologic data, echocardiographic diagnosis, details of the procedure and clinical course were reviewed. The end point for follow-up of this study was December 2002.

RESULTS

Thirty patients underwent BAS from January to December 2001 with an age range from 1 to 213 days (mean 30.40 ± 41.97 days). Table 1 displays the details of each patient.

BAS was selectively performed *via* the umbilical vein in 6 cases with 4 successes. Failure prompted the cardiologists to perform BAS *via* the femoral vein with 100 per cent success. Nine cases were more than 30 days of age on the date of the BAS with the oldest patient being 213 days old. No significant immediate complication occurred in any patients.

There were 5 deaths prior to the surgery. 2 cases died 15 and 5 days after BAS respectively. The first case (case 8) was diagnosed to have total anomalous pulmonary venous return (TAPVR) with obstruction of blood flow at the atrial septal defect. He came in with cardiogenic shock and needed emergency BAS. Hemodynamic seemed to be improved but there was multiple organ failure followed by clinical sepsis. The second case (case 18) was diagnosed to have pulmonary atresia with intact ventricular septum and came in with marked cyanosis and severe metabolic acidosis. Ductal opening by prostaglandin E1 was delayed because of the problem with intravenous access. Consciousness and multiple organ function were not regained despite an increase in arterial oxygen saturation.

The parents of case 9 refused to have any further operation for their baby and the authors lost him 2 days later. Two more cases (cases 2 and 29) died from pneumonitis prior to the surgery after improvement by BAS on the first admission.

In the 13 cases with a diagnosis of TGA, 1 case (case 11) was transferred to another tertiary care hospital near the parents' home and 1 case (case 20) was lost to follow-up. The other 11 cases underwent arterial switch operations with 8 in the rapid 2-stage group. There was 1 operative death.

In 7 cases of pulmonary atresia with intact ventricular septum (PA), all except one (case 9) underwent successful modified Blalock-Taussig shunt and were doing well at the end of the present study. A case of tricuspid atresia (TA) also underwent successful modified Blalock-Taussig shunt and was also doing well at the end of the study.

In 6 cases of TGA and VSD, 2 underwent arterial switch operations with VSD closure. Two cases had recurrent pneumonia and the operation had to be postponed several times. There was 1 operative death in this group.

One of the 2 cases diagnosed to have TAPVR underwent intracardiac repair after stabilization of BAS and was doing well at the end of the study.

The only case of TGA, VSD with pulmonic stenosis, was stable after BAS and doing well, waiting for a Rastelli operation at the end of the study.

DISCUSSION

BAS has been known for a long time for its safety and efficacy to palliate several types of cyanotic congenital heart diseases even after the first month of life[1, 3-5]. Presentation to cardiologists was usually very late. Nine cases in the present study were more than 1 month of age with the maximal age of 213 days. With the availability of prostaglandin E, many infants could undergo definite surgery without the need for this procedure[6] but unfortunately the high cost of the drug prohibits its widespread and long-term use in developing countries such as Thailand.

At the beginning of this century, the authors tried to pass a balloon catheter *via* the umbilical vein

Table 1. Details of the patients who underwent BAS.

Case no.	Diagnosis	Age in days at the time of BAS	Status at the end of the study
1	TGA	1	ASO at 10 days - good
2	TGA + VSD	1	Dead before operation at the age of 2 months
3	PA	7	RMBTS, then LMBTS at 18 months, now - stable
4	TGA	59	Rapid 2 stage, ASO - good
5	TGA	2	ASO at 8 days - good
6	TGA	1	ASO at 11 days - good
7	PA	41	RMBTS at 11 months, now - stable
8	TAPVR	70	Dead before operation with sepsis 15 days after BAS
9	PA	2	Dead before operation after the parents refused surgery
10	TGA, VSD, PS	68	Stable
11	TGA	1	Refer
12	TGA, VSD	61	ASO with VSD closure at 5 months - good
13	TGA	7	ASO at 10 days - dead early after the operation
14	PA	1	RMBTS at 8 days, now - stable
15	TA	54	RMBTS at 2 months, now - stable
16	TGA, VSD	61	ASO with VSD closure at 3 months - good
17	TGA	21	Rapid 2 stage, ASO at 4 months - good
18	PA	8	Dead before operation with sepsis 5 days after BAS
19	TAPVR	49	Intracardiac repair at 3 months - good
20	TGA	25	Lost to the follow-up
21	TGA	2	Rapid 2 stage, ASO at 6 months - dead early post-operation
22	PA	213	RMBTS at 15 months, now - stable
23	TGA	1	ASO at 15 days - good
24	TGA	24	Rapid 2 stage, ASO at 12 months - good
25	TGA	1	ASO at 18 days - good
26	TGA, VSD	23	Waiting for rapid 2 stage, ASO with VSD closure
27	TGA	28	Rapid 2 stage, ASO at 10 months - good
28	PA	16	RMBTS at 18 days, now - stable
29	TGA, VSD	49	Dead before the operation at 4 months
30	TGA, VSD	16	Waiting for rapid 2 stage, ASO with VSD closure

ASO = arterial switch operation, RMBTS = right modified Blalock-Taussig shunt,
LMBTS = left modified Blalock-Taussig shunt, TA = tricuspid atresia, TAPVR = total anomalous pulmonary venous return,
TGA = transposition of great arteries, TGA, VSD = transposition of great arteries with ventricular septal defect,
PA = pulmonary atresia with intact ventricular septum

in cases less than 72 hours of age and had fairly good results (66.67% success rate). The reason for trying the umbilical venous route was to shorten the time elapsed from initial assessment to commencement of BAS and the procedure time in moribund patients as suggested by others[7-10]. BAS *via* this route was employed for only a few seconds and if it failed, the authors could proceeded to perform BAS *via* the femoral vein in the standard manner without significantly increasing the procedure time.

Although there have been several reports of serious complications of BAS[11-14], with experience and careful handling, the procedure is rather safe. There were no significant complications in the present study even in very late cases (cases 4, 12, and 22).

The total deaths seem to be large but can be explained by the late presentation to the cardiologists. A strategic plan to increase accessibility to a cardiologist early in life is needed. With several limitations of surgery, 2 cases could not wait (cases 2 and 29). A political way to expand the number of operations was also needed to prevent these two latter fatal cases.

Most of the cases had good intermediate outcome with the median time of follow-up of 17.8 months. There were only 2 early post-operative deaths (cases 13 and 21).

SUMMARY

BAS is a safe and effective palliative procedure for patients with various types of cyanotic congenital heart disease. Age more than 1 month is

not a contraindication for this procedure. The umbilical venous route can be used effectively without significant problems. The overall mortality is low and not related to BAS.

(Received for publication on May 14, 2003)

REFERENCES

1. Rashkind WJ, Miller WM. Creation of an atrial septal defect without thoracotomy: A palliative approach to complete transposition of the great arteries. JAMA 1966; 196: 991-2.
2. Kumpeng V, Bunthid B, Pongsangium V, Ratreesawad V, Puapant Y. Balloon atrial septostomy for the transposition of the great arteries under 2-D echocardiography in neonatal care unit: Report of 2 cases. Bull Dept Med Serv 1987; 12: 35-40.
3. Jamjureeruk V, Sangtawesin C, Layangool T. Balloon atrial septostomy under two-dimensional echocardiographic control: A new outlook. Pediatr Cardiol 1997; 18: 197-200.
4. Serratto M, Bucheleres HG, Bicoff P, Miller RA, Hastreiter AR. Palliative balloon atrial septostomy for total anomalous pulmonary venous connection in infancy. J Pediatr 1968; 73: 734-9.
5. Tynan MJ. Balloon atrial septostomy. Arch Dis Child 1968; 43: 744-5.
6. Reddy SC, Saxena A. Prostaglandin E1: First stage palliation in neonates with congenital cardiac defects. Indian J Pediatr 1998; 65: 211-6.
7. D'Orsogna L, Lam J, Sandor GG, Patterson MW. Assessment of bedside umbilical vein balloon septostomy using two-dimensional echocardiographic guidance in transposition of great arteries. Int J Cardiol 1989; 25: 271-7.
8. Ashfaq M, Houston AB, Gnanapragasam JP, Lilley S, Murtagh EP. Balloon atrial septostomy under echocardiographic control: Six years' experience and evaluation of the practicability of cannulation *via* the umbilical vein. Br Heart J 1991; 65: 148-51.
9. Abinader EG. Balloon atrial septostomy *via* the umbilical vein. Br Heart J 1992; 67: 204-5.
10. Kerkar PG, Dalvi BV. Balloon atrial septostomy *via* the umbilical vein. Br Heart J 1992; 67: 205-6.
11. Williams GD, Ahrend TR, Dungan WT. An unusual complication of balloon-catheter atrial septostomy. Ann Thorac Surg 1970; 10: 556-9.
12. Hohn AR, Webb HM. Balloon deflation failure: A hazard of "medical" atrial septostomy. Am Heart J 1972; 83: 389-91.
13. Crosson J, Ringel RE, Haney PJ, Brenner JI. Pneumopericardium as a complication of balloon atrial septostomy. Pediatr Cardiol 1987; 8: 135-7.
14. de Moor M, Pribut H, Hugo-Hamman C. The switch to balloon atrial septostomy with echocardiographic guidance-a severe complication. S Afr Med J 1996; 86 (Suppl 2): C97-9.

Balloon atrial septostomy ในสถาบันสุขภาพเด็กแห่งชาติมหาราชินี พ.ศ. 2544

ชัยสิทธิ์ แสงทวีสิน, พบ, ธนะรัตน์ ลยางกูล, พบ*,*
ธวัชชัย กิระวิทยา, พบ, อมรรัตน์ เพชรดำรงสกุล, วทบ*,*
ฌานิสา อินทศร, วทบ, พุทธา น้อยแสง, วทบ*, สมพัน กลั่นดีมา, วทบ**

บทนำ : Balloon atrial septostomy (BAS) เป็นหัตถการเบื้องต้นในการช่วยชีวิตทารกที่มีโรคหัวใจพิการแต่กำเนิดหลายชนิด รายงานแรกในประเทศไทยมีมาตั้งแต่ พ.ศ. 2530 ปัจจุบันมีการเปลี่ยนแปลงในการรักษาไปมากจึงเห็นสมควรมีการทบทวนหัตถการนี้อีกครั้ง

วัตถุประสงค์ : เพื่อศึกษาผลการทำ BAS ในปัจจุบันในระยะสั้น และระยะกลาง

ผู้ป่วยและวิธีการ : ศึกษาย้อนหลังจากรายงานผู้ป่วย 30 รายที่ทำ BAS ตั้งแต่เดือนมกราคม 2544 ถึง ธันวาคม 2544 นำข้อมูลทางระบาดวิทยา การวินิจฉัย รายละเอียดหัตถการ และผลการรักษาติดตามผู้ป่วยจนถึงเดือนธันวาคม 2545

ผลการศึกษา : ผู้ป่วยที่ทำ BAS ทั้งสิ้น 30 ราย อายุระหว่าง 1–213 วัน เฉลี่ย 30.40 $\pm$ 41.97 วัน การทำ BAS ส่วนใหญ่ทำทาง femoral vein มี 6 รายที่แพทย์ใช้ umbilical vein ก่อน และทำได้ 4 ราย การวินิจฉัยส่วนใหญ่เป็น complete transposition of the great arteries (TGA), pulmonary atresia with intact ventricular septum (PA) และ transposition of the great arteries with ventricular septal defect (TGA, VSD) ไม่มีภาวะแทรกซ้อนใดๆที่รุนแรงใน 24 ชั่วโมงแรกหลังทำ การติดตามเมื่อสิ้นสุดการศึกษามีทารก 5 รายเสียชีวิตก่อนผ่าตัด และอีก 2 รายเสียชีวิตหลังผ่าตัด คิดเป็นการเสียชีวิตรวมร้อยละ 23.3

สรุป : BAS ยังคงเป็นหัตถการเบื้องต้นในการช่วยชีวิตทารกที่ปลอดภัย และอาจได้ผลดีแม้ทารกจะอายุมากถึง 7 เดือนแล้ว การทำทาง umbilical vein อาจได้ผลในบางราย อัตราตายโดยทั่วไปแม้จะสูง แต่ไม่ได้เกี่ยวข้องโดยตรงจากการทำ BAS

คำสำคัญ : สายสวนหัวใจชนิดพิเศษ, สถาบันสุขภาพเด็กแห่งชาติมหาราชินี, 2544

ชัยสิทธิ์ แสงทวีสิน, ธนะรัตน์ ลยางกูล, ธวัชชัย กิระวิทยา, และคณะ
จดหมายเหตุทางแพทย์ ฯ 2546; 86 (ฉบับพิเศษ 3): S517–S521

* หน่วยกุมารเวชศาสตร์โรคหัวใจ, สถาบันสุขภาพเด็กแห่งชาติมหาราชินี, กรุงเทพ ฯ 10400