# Effects of balloon atrial septostomy on changes in left ventricular volume in patients with transposition of the great arteries

## Thesis

## Submitted for partial fulfillment of the master degree in cardiology


By

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# Introduction

The natural history of untreated transposition of the great vessels in the neonate is poor. Complete correction has been possible since 1959 with the atrial switch procedure, first described by **Senning in 1959. Mustard in 1964** simplified this method, reducing mortality rates to a reasonable level. The best results with these procedures were achieved in children beyond six months of age. Therefore an early palliation by creation of an intraatrial communication was imperative (Blalock and Hanlon in 1950).

**In 1966 Rashkind and Miller** described a nonsurgical procedure to create an atrial septal defect, using a balloon catheter. Since then it has remained an integral part of cardiac catheterisation in neonates, even after the introduction of **the arterial** switch procedure by **Jatene and associates in 1976.**

Balloon atrial septostomy is an accepted method for palliation of certain types of congenital heart disease since its early introduction by **Rashkind in 1966**. It was the first intracardiac non surgical interventional procedure. It could be of potential benefit in patients with other severe congenital heart defects, such as tricuspid or mitral atresia, or total anomalous pulmonary venous drainage,with a restrictive foramen ovale.The use of two-dimensiona transthoracic echocardiography to monitor the procedure **(Kipel et al, 1991)**

Since in patients with transposition of the great arteries the systemic venous blood & the pulmonary venous blood are parallel. the aim of balloon or blade atrial septostomy is to enlarge the foramen ovale to allow oxygenated blood to pass into the right atrium and mix with the

deoxygenated blood that is recirculating around the body. Static balloon atrial septostomy is a variation of balloon atrial septostomy. Which is usually used to enlarge the hole made in the inter-atrial wall during blade septostomy? This procedure aims to prolong survival until definitive surgery can be performed several months later.

Catheter is advanced from the inferior vena cava to the right atrium across the foramen ovale to the left atrium with the echo transducer in the subxiphoid position. The balloon is inflated and its position within the left atrium is confirmed by echo. The catheter is withdrawn according to the technique of Rashkind. Withdrawal is halted when the balloon traverses the atrial septum. Adequate septostomy is indicated on echo by a defect at least 5 mm in diameter and by flapping of the inferior rim of the atrial septum. There were no complications using this technique and a clinically adequate septostomy was achieved in each patient. Two-dimensional echocardiography-assisted balloon atrial septostomy minimizes risk of complications and decreases exposure to ionizing radiation.

## Aim of the work:

Study of the effects of Balloon atrial septostomy in patients with d-TGA on changes of left ventricular volumes, immediate & short term results & relate it to the degree of tissue oxygenation.

## Patients & methods:

All patients with d-TGA admitted to Ain Shams University Hospital Cardiology Department for balloon atrial septostomy will be included in this study.

**Patients will be excluded from the study if:**

1- Patients with non restrictive interatrial communication.

2- Patients with non restrictive interventricular communication.

**All patients will undergo**

1-Full echocardiographic study:

-Confirm the diagnosis of a d-TGA.

-Asses possible other associated anomalies.

-Measure LV volumes using Simpson's method, before the procedure, immediately after the procedure (within one hour) & after 2 weeks of the procedure.

2- Serum sample will be withdrawn before the procedure & immediately after the procedure (within one hour) to measure serum lactate as an assessment of tissue oxygenation.

Results will be plotted in tables & statistically studied.

# References

**Blalock A, Hanlon CR.:** The surgical treatment of complete transposition of the aorta and the pulmonary artery. Surg Gynecol Obstet 1950; 90: 1- 15.

**Jatene AD, Fontes VF, Paulista PP, Souza LCB, Neger F, Galantier M, Sousa JEMR.:** Anatomic correction of transposition of the great vessels. J Thorac Cardiovasc Surg 1976; 72: 364- 70.

**Kipel G, Arnon R, Ritter SB.:** Transesophageal echocardiographic guidance of balloon atrial septostomy. J Am Approach to Echocardiogr 1991; 4: 631-5.

**Mustard WT.:** Successful two-stage correction of transposition of the great vessels. Surgery 1964; 55: 469- 72.

**Rashkind WJ, Miller WW.:** Creation of an atrial septal defect without thoracotomy. A Palliative Complete Transposition of the Great Arteries. JAMA 1966; 196: 991-2.

**Senning A.:** Surgical correction of transposition of the great vessels. Surgery 1959; 45: 966- 80.

# *ABSTRACT*

Simple transposition of the great arteries is one of the most common lethal causes of congenital cyanotic heart diseases.

Between September 2007 and February 2008, 15 patients with age ranged between 1 day and 60 days - were diagnosed to have d-transposition of great arteries, underwent balloon atrial septostomy under two-dimensional echocardiographic guidance.

Left ventricular volume was measured. Using Simpson's method before the procedure, immediately after the procedure and after 2 weeks of the procedure, and it demonstrated little or no change with this intervention. Serum sample was withdrawn before the procedure, and immediately after the procedure measuring serum lactate as an assessment of tissue oxygenation with decrease in the mean serum lactate and improvement of tissue oxygenation.

The balloon atrial septostomy was successful in 13 patients, and 2 patients did not improve inspite of adequately created atrial septal defects. There were no significant complications related to the balloon atrail septostomy and these results demonstrate that it is an effective palliation of transposition of the great arteries



**KEYWORDS**

*Balloon atrial septostomy.*

*Two-dimensional Echocardiography.*

*Transposition of great arteries.*

*Congenital cyanotic heart disease.*

*Dedication*

# To My Mother And Father For Their Ceaseless Love And Support

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***Mahmoud Farag Abd elmottileb***

# *CONTENTS*

# *Normal Values*

| | Normal Values | In Neonates |
|---|---|---|
| BT | 4-8 min. | |
| Ca | 9-11 mg/dl | |
| CT | 8-12 min. | |
| Glucose | 50-90 mg/dl | |
| Hb | 11-14 g/dl (in 2 months) | 145-22 gm/dl |
| Ht | 33-42% | 44 – 72% |
| K (serum) | 3.5 – 5 mmol/L | |
| Na (serum) | 134 – 146 mmol/L | |
| Platelets | $120 – 400 \times 10^3 /mm^3$ | |
| PT | 11 – 15 seconds | |
| PTT | 25 – 35 seconds | |
| WBCs | 4000 – 10000 ug/dl | |
| Serum lactate | 0.7-2.1mmol\L | |

# *LIST OF TABLES*

Page

# *LIST OF FIGURES*

Page