

تقييم نتائج الحالات المحجوزة بوحدة رعاية قلب الأطفال خلال الست أشهر الأولى من العام
٢٠٠٨ مستشفى الأطفال جامعة القاهرة

رسالة مقدمة من

الطبيب/ محمد هشام محمد مشالى

توطئة للحصول على درجة الماجستير فى طب الأطفال

تحت اشراف

ا.د سلوى حلمى عمران

أستاذ طب الأطفال

كلية الطب جامعة القاهرة

ا.د ايمان عبد العظيم شرف

أستاذ طب الأطفال

كلية الطب جامعة القاهرة

ا.د زينب صلاح سليم

أستاذ طب الأطفال

كلية الطب جامعة القاهرة

كلية الطب

جامعة القاهرة

٢٠٠٩

**Evaluation of the Outcome of Cases Admitted In Pediatric
Cardiac ICU during the First 6 month of the year 2008 in
Pediatric Hospital, Cairo University**

Submitted for fulfillment of the Masters degree in Pediatric medicine

By

Muhammad Hesham Muhammad Mashaly

(M.B.B.Ch)

Supervised by

Professor. Dr. Salwa Helmy Omran

Professor of Pediatrics
Faculty of Medicine
Cairo University

Professor. Dr. Eman Abd ElAzeem Sharaf

Professor of Pediatrics
Faculty of Medicine
Cairo University

Professor. Dr. Zeinab Salah Selim

Professor of Pediatrics
Faculty of Medicine
Cairo University

Faculty of Medicine

Cairo University

2009

Acknowledgement

First of all, I thank ALLAH the most merciful and the most graceful.

I would like to show my deepest thanks, appreciation and gratitude to Dr.Salwa Omran for her utmost support and complete understanding. She dedicated a lot of time and effort to this thesis, which helped accomplishing the work in the best way possible.Working with her was a true honor and it addad a lot to my scientific knowledge and way of thinking.

I would also like to thank Dr.Eman Sharaf for her continuous encouragement and helpful guidance all throughout this thesis.I truly appreciate her patience in answering all my questions.

I would like to thank Dr. Zeinab Salah for her outstanding efforts,accurate assessement and scientific guidance.

I would like to express my special gratitude to the spirit of my father,my mother,my sister,my wife and my son for their love,encouragement and support.They are the secret of my success.

Last, but not least , I would like to thank my professors, friends and colleagues in the pediatric department.

Abstract

Background: Although great progress in pediatric cardiac surgery has been achieved in recent years, significant gaps still persist between our pediatric cardiac surgery centers and international centers.. Compared with developed countries, prominent gaps exist in surgical treatment of certain types of complex congenital heart diseases.

Aim of the study: The current study highlights how the practice of pediatric cardiac surgery in the **Pediatric Cardiac ICU , Children's hospital , Cairo University** compares with first-world standards and outline some of the problems faced by pediatric cardiac services in developing nations.

Patients and methods: Our study included a total of **234** patients admitted to the Cardiac Intensive Care Unit (CICU), Children's Hospital, Cairo University during the 6 months period between **1/1/2008 to 30/6/2008**. Of the included 234 patients, **121** underwent cardiovascular surgeries and **113** underwent cardiac catheterization.

Results: Retrospective analysis of the data of the patients records was done. Types of **cardiothoracic surgeries** included in this retrospective study were either closed which was done in 36.4% of cases or open which was done in 63.6% of cases. Type of procedure was either corrective surgery which was done in 82.6% of cases, palliative surgery in 12.3% of cases and others in 5.1% of cases and the **mortality rate** was **26%** and the main cause of death was found to be surgery-related (24% of cases).The most commonly performed operation in the current study was VSD closure followed by PDA closure followed by arterial switch operation. Truncus arteriosus Correction has the worst outcome with 100% mortality . The best outcomes were reported with closure of PDA, TAPVR, Fontan operation, atrial switch and ASD closure with zero mortality rate. Post-operative **complications** were reported in **63%** of cases and the most striking finding was the high prevalence of **pneumonia** as the commonest complication as it was encountered in **35.5%** of cases. Regarding the **cardiac catheterization**, our study

included **113** cases undergoing catheterization which was diagnostic in 48 cases (42%) or interventional in 65 cases (58%). Balloon valvoplasty was the commonest procedure done. **Death** was encountered in only **12%** of cases with hypoxic spells as the most common cause of death . **Complications** developed in **30%** of cases and the commonest were vascular complications .

Conclusion: As a conclusion , it is important to point out that mortality rate of cardiothoracic surgery in our study was 26 % and surgery-related causes were the most common cause of death. Mortality rate of cardiac catheterization was 12% and hypoxemic spells were the most common cause of death. The rate of complications following cardiothoracic surgery was 63% and the most frequent complication was infections particularly pneumonia . The rate of complications following cardiac catheterization was 30% and the most frequent complication was vascular complications.

Keywords: *Pediatric cardiothoracic surgery, Pediatric cardiac catheterization, mortality rate, morbidity rate.*

List of Abbreviations

- AAP (Average Atrial Pressure)
- APTT (Activated Partial Thromboplastine time)
- ARF (Acute Renal Failure)
- ASA (American Society of Anesthesiologist)
- ASD (Atrial Septal Defect)
- ASO (Arterial Switch operation)
- AV (Atrio Ventricular)
- AVSD (Atrioventricular Septal defect)
- BDG (Bidirectional Glenn)
- BT Shunt (Blalock-Taussig Shunt)
- C.O (Cardiac Output)
- CHD (Congenital heart disease)
- CoA (Coarctation of aorta)
- CPAP (Continuous positive airway pressure)
- CVP (Central Venous Pressure)
- DIC (Disseminated Intravascular Coagulopathy)
- ECC (ExtraCorporeal Circulation)
- ECG (ElectroCardiogram)
- FIO₂ (Fraction of Inspired Oxygen)
- H.F (Heart Failure)
- Hb (Hemoglobin)
- HLHS (Hypoplastic Left heart syndrome)
- Ht (Hematocrite)

- HTN (Hypertension)
- ICU (Intensive Care Unit)
- JET (Junctional Ectopic Tacchycardia)
- LAP (Left Atrial Pressure)
- LV (Left Ventricle)
- LVOT (Left Ventricular outflow tract)
- MAPCAs (Multiple Aorto Pulmonary Collateral arteries)
- NO (Nitric Oxide)
- OR (Operating room)
- PAB (Pulmonary Artery Banding)
- PDA (Patent Ductus Arteriosus)
- PEEP (Positive end expiratory pressure)
- PF/S (Pleural fluid serum ratio lymphs,lymphocytes)
- PHT (Pulmonary Hypertension)
- PICU (Pediatric Intensive Care unit)
- PMN (Polymorphonuclear leucocytes)
- PVO (Pulmonary Venous Obstruction)
- PVR (Pulmonary Venous return)
- RVOTO (Right Ventricular outflow tract obstruction)
- S (Serum)
- SaO2 (Arterial Oxygen Saturation)
- SAP (Systemic Arterial Pressure)
- SAS (Subaortic Stenosis)
- SIADH (Syndrome of Inappropriate Antidiuretic Hormone)
- SVC (Superior Vena Cava)

- SVO2 (Systemic Venous Oxygen Saturation)
- SVR (Systemic Venous return)
- SVT (Supra Ventricular Taccychardia)
- TA (Truncus Arteriosus)
- TAPVR (Total Anomalous pulmonary venous return)
- TGA (Transposition of great arteries)
- TOF (Tetrology of Fallot)
- TT (Thrombin Time)
- TV (Tricuspid Valve)
- VSD (Ventricular Septal Defect)

<u>List of figures.</u>	Page no.
Figure (1): The anatomic type of TA	49
Figure (2): Outcome of cardiothoracic surgery.	91
Figure (3): Mortality in corrective surgeries.	92
Figure(4): Mortality in palliative and other surgeries.	92
Figure (5): Main cause of death after cardiothoracic surgeries.	93
Figure (6): Frequency of complications.	94
Figure (7a): Respiratory complications in corrective surgeries.	95
Figure (7b): Respiratory complications in palliative and other surgeries	96
Figure (8): Duration of ventilation.	97
Figure (9): Frequency of ventilation.	97
Figure (10a): cardiac complication in corrective surgeries	98
Figure (10b):cardiac complication in palliative and other surgeries	98
Figure (11); Inotropic support.	99
Figure (12a):Infection in corrective surgeries	100
Figure (12b):Infection in palliative and other surgeries	101
Figure (13):Antibiotics	102
Figure (14a):Renal and metabolic complication in corrective surgeries	103
Figure(14b):Renal and metabolic complication in palliative and other	103
Surgeries	
Figure (15a):Neurological complication in corrective surgeries	104
Figure (15b):Neurological complication in palliative and other	105

Surgeries

Figure (16a):Hematological complication in corrective surgeries	106
--	------------

Figure (16b):Hematological complication in palliative and other	107
--	------------

Surgeries

Figure (17): Relation between age,compliations,	108
--	------------

Figure (18): Relation between sex, compliations and mortality.	109
---	------------

Figure (19): Relation between ICU stay and mortality.	109
--	------------

Figure (20): Relation between type of procedure, compliations and mortality.	110
---	------------

Figure (21): Relation between type of surgery , compliations and mortality.	110
--	------------

Figure (22):Type of catheter.	111
--------------------------------------	------------

Figure (23): Different of catheter procedures	112
--	------------

Figure(24):Outcome of cardiac catheterization	112
--	------------

Figure (25): Catheter compliations	114
---	------------

Figure(26): Causes of death after cardiac catheterization	115
--	------------

Figure(27): Compliations of different catheter procedures	116
--	------------

Figure (28): Relation between mortality and type of catheterization	117
--	------------

<u>List of tables</u>	Page no.
Table (1): system approach to postoperative care following surgery for congenital heart disease	4
Table (2): differential diagnosis of unexpected hypoxaemia after operation	58
Table (3): composition of pleural fluid in different conditions	61
Table (4): guidelines for postoperative support in high risk patient	67
Table (5): potential complications in the catheterization	89
Table (6): Types of Surgery	90
Table (7): Types of procedure	90

Review Of Literature

Introduction

The care of children with congenital heart disease has changed significantly because of advancements in multiple fields. Advancements in cardiology , surgical techniques, postoperative care, and medications have improved the long-term survival rate of infants and children with congenital heart disease. Postoperative care should focus on anticipating harmful events and promoting a proactive approach in the management of these patients. Most interventions in the immediate postoperative period focus on the prevention of low cardiac output and the adverse events in the major organ systems (*Ascenzi et al., 2007*).

Ideal postoperative care of the patient following either reparative or palliative operations requires a thorough understanding and systematic evaluation of the following: (a) the underlying anatomic defect, (b) the pathophysiology of the preoperative state (including secondary effects on other organ systems from altered cardiac output preoperatively), (c) the anesthetic regimen used during surgery, (d) CPB issues (e.g., duration of bypass and circulatory arrest), (e) the details of the operative procedure and any concerns of the surgeon regarding the potential for residual defects, (f) data available from monitoring catheters, echocardiography, and cardiac catheterization. Optimal management of these critically ill children can best be achieved through a harmonious team approach, combining the expertise of cardiologists, cardiac surgeons, anesthesiologists, intensivists, nurses, and respiratory therapists (*Nicholas , 2006*).

Convalescence after cardiac surgery may be characterized as normal or abnormal. Normal convalescence is recovery that is expected given the preoperative state of the patient, the procedure performed, and the expected effects of cardiopulmonary bypass or other interventions. Abnormal convalescence is recovery that is prolonged or unexpected given what is known about the patient and the interventions that have been performed. It may be due to unknown or underappreciated abnormal preoperative anatomy or physiology, to unexpected complications of bypass, to residual anatomic defects, or to abnormalities in other organ systems such as pneumonia or sepsis. It is crucial to identify abnormal convalescence and to characterize it thoroughly so that appropriate intervention can take place in a timely fashion (*Fuhrman & Zimmerman, 2005*).

A. Postoperative Cardiac complications :

I. General postoperative complications

II. Postoperative complications specific to each type of surgery:

i. Corrective surgeries

ii. Palliative surgeries

I. General Postoperative complications:

Majority of the mortality and morbidity after cardiac surgery results from complications arising from systems other than the heart . A small percentage of the mortality is directly related to the cardiac condition. It begins with a major insult to one particular system such as pulmonary , neural ,or renal. Following that the events cascade onto the other systems like a domino effect that eventually leads to mortality and morbidity in that patient . The occurrence of such an initial insult is predictable in certain patient population even though we can't identify which of those patients is going to suffer a fatal blow from such complications (*Nikam & Livesay, 2005*)

The incidence of some of these events leading to a significant morbidity or mortality can be reduced by preventing events that precipitate a given complication or by early recognition treatment that can minimize the morbidity and hopefully prevent mortality (*Polese et al., 1999*).

Table (1) System approach to postoperative care following surgery for congenital heart disease

System and problem	Etiology
Nervous system • Coma • Focal lesions • Seizures • Diaphragmatic paralysis • Vocal cord paralysis • Horner syn drome • Paraplegia • Pain	• Global ischemia Prolonged anesthetic effect Hypoglycemia • Emboli (air, thrombi) • Metabolic, Ischemic, embolic • Phrenic nerve injury • Traction on recurrent laryngeal nerve • Dissection of subclavian artery with sympathetic chain injury • Postcoarctation repair with spinal artery ischemia Surgical trauma • Stress
Respiratory System • ARDS postpump syndrome • Pulmonary oedema • Pleural effusion • Chylothorax • Atelectasis • Pneumonia • Pulmonary hypertension • Stridor	• Possible release of vasoactive substance by cardiopulmonary bypass • Heart failure , left sided obstruction, fluid overload • Hemothorax, early serous effusion & delayed postcardiotomy syndrome • Injury to thoracic duct • Hypoventilation, poor cough • Aspiration, nosocomial, bacterial • Pre-operative pulmonary hypertension, repair of TAPVR • Vocal cord oedema, paralysis
Cardiovascular System • Bradycardia , sick sinus syndrome , atrioventricular block • Right bundle branch block • Tachyarrhythmias • Poor cardiac output • Pericardial temponade • Hypertension • Mesenteric arteritis	• Injury to interatrial or interventricular conduction system • Right ventriculotomy • Supraventricular , junctional tachycardia , ventricular tachycardia • Cardiogenic Right ventriculotomy Prolonged pump or cross clamp time or infarction Hypocalcemia , hypovolemia • Pericardial effusion , acute hemorrhage , serous pericardiotomy syndrome • Stress, pain Postcoarctectomy syndrome
Renal-metabolic	