EurAsian Journal of BioSciences
Eurasia J Biosci 14, 04-06 (2021)

Chest X-Ray, Cardiac Catheterization, and Pulse Oximetry Application in Medical Interventions

Callisto Ricci
Asst. Prof.
Universiti Malaya (UM), Malaysia

Abstract
Also perceived to be a painless procedure, chest X-ray creates pictures that depict the chest's structure while seeking to understand the functioning of lungs and the heart. The test aids in understanding whether the lungs have extra fluid or extra blood flow or whether the heart is enlarged; an outcome that could depict heart failure. If the right ventricle is enlarged, chest X-rays reveal boot-shaped hearts. Regarding the approach of pulse oximetry, small; sensors are attached to the toes or fingers (like adhesive bandages) to provide estimated outcomes regarding the amount of oxygen present in the blood. In this procedure, flexible and thin tubes (referred to as catheters) are placed into veins of the arm, neck, or groin (upper thigh) and threaded top the heart. A special dye is then injected into one of the heart chambers or a blood vessel to allow doctors assess the flow of blood through blood vessels and the heart on X-ray images. Cardiac catheterization is also used by doctors to measure oxygen and pressure levels inside the blood vessels and heart chambers to determine the possibility of blood mixing between two sides of the heart (Al Habib et al., 2010). Notably, the injection of dye into a blood vessel or the heart chambers aids in making the heart structures of the baby visible on X-ray pictures.

Keywords: Chest X-Ray, Cardiac, Catheterization, Pulse Oximetry etc.

1 Introduction

With expansions in the adoption and implementation of fetal ultrasound reported in most of the current healthcare organizations, congenital heart diseases have been observed to be established before birth. This establishment enables medical teams to prepare for immediate initiations of PGE and transfers to cardiac centers for surgical and medical management at birth. Specifically, a majority of the neonates have had umbilical lines placed and intubated in some cases. These procedures form precautionary measures prior to transport to tertiary care centers (Fraser & Carberry, 2012). In situations where neonates are diagnosed postnatally, these infants tend to present with cyanosis shortly after birth. In the nursery, the initial stage of medical management is dominated by the prevention of hypoxemic spells and the maintenance of adequate oxygenation until surgical corrections are performed. In the presence of mild pulmonary stenosis, infants are generally monitored in hospitals to allow the close-up of the patent ductus while providing follow-up care to prevent complications preceding surgical care. Before discharge, clinicians may also consider fluorescent in situ (FISH) testing and chromosomal analysis.

2 Methodology

Regarding genetic testing, the measures are applied in situations where patients are reported to have a typical ToF repair. However, the approach does not apply for smaller groups reported to pose more complex subtypes. In relation to the outcomes, patients with ToF and exposed to genetic testing can exhibit significant associated chromosomal abnormalities or genetic syndromes; including Alagille syndrome and trisomies. Notably, genetic testing poses implications on patient management and family counseling that constitutes additional follow-up.

3 Results and Discussion

In a study by Parker, Mai and Canfield et al. (2010), it was found that ToF causes delayed growth and development. One of the specific developmental disruptions involves leaking heart valves. The four valves of the heart can close and open with each

Received: July 2020
Accepted: September 2020
Printed: January 2021

heartbeat. The role of this opening and closing of the valves lies in the need to ensure that the blood flow is unidirectional. Therefore, situations, where valves fail to seal tightly, are marred by blood leaking back into chambers where it may have come from. The process translates into regurgitation or backflow and yields additional symptoms and complications. In most cases, a repair of ToF is followed by pulmonary backflow or leakage from the pulmonary valve. Additional events or disruptions the follow ToF repair include backflow from the aortic valve or the tricuspid valve (Webb, Smallhorn, Therrien & Redington, 2015). As affirmed by Kliegman, Stanton, St Geme and Schor (2016), leaking valves can be replaced via catheter-based procedures and surgery.

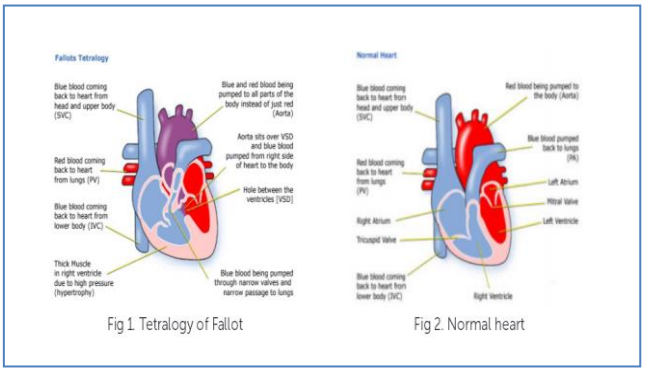

Fig 1. Tetralogy of Fallot Fig 2. Normal heart

Developmental disruptions arising from ToF repair are also felt in terms of arrhythmias. These problems arise in terms of disrupted rhythms of the heartbeat or the rate of the heartbeat. Specific arrhythmias arising from ToF include atrial flutter, atrial fibrillation, and ventricular tachycardia (Barron, 2013). Over time, a repeated narrowing of the pulmonary artery could yield pulmonary artery branch stenosis. The resultant challenge lies in the reduction of blood flowing to the lungs. Right ventricular aneurysms may also result from ToF due to the weakened areas of the ventricle. The weakening is linked to the patch adopted in fixing the ventricular septal defect (VSD) (Al Habib et al., 2010). The areas balloon out or bulge and impair the heart functionality. Additional adversities include residual ventricular septal defects and the coronary heart disease. As individuals who have been diagnosed with ToF approach middle age, they are likely to develop the coronary heart disease whereas arteries experience a build-up of plaque, a waxy substance that yields tertiary effects in terms of the heart attack, shortness of breath and chest pain (Fraser & Carberry, 2012).

One of the procedures in the current plan entails nutrition and feeding. With babies diagnosed with ToF, it remains inferable that they are likely to tire while feeding or nursing. Therefore, this plan advocates for frequent and small meals because they tend to be easier to handle. As documented by Barron (2013), these children may need extra nutrition. Therefore, extra or supplementary feeding will give the babies more iron, vitamins, and calories. However, this process needs to be achieved in conjunction with the children's doctors to make informed decisions on whether the babies need extra nutrition or not.

In the home setting, another aspect that needs to be handled involves the Tet spells. According to Al Habib et al. (2010), Tet spells are common in situations where ToF is yet to be repaired. Therefore, the need to lower adversities of stress or anxiety in these groups needs to be imperative because of the need to save energy among the affected groups. Specifically, the babies need to be slowly picked up and spoken to in soothing voices to avoid startling them. The eventuality needs to be a prevention or reduction of crying among the babies diagnosed with ToF. Notably, the doctors needs to be consulted regarding specific management procedures that could curb Tet spells in each individual baby. Some of the projected actions will include bringing the children's knees up tight against their chests (often referred to as the knee-chest positions) or having these groups squat down to improve the rate of blood flow to the lungs. Additional steps will include calming the children and calling in the emergency groups in situations where the symptoms fail to improve.

4 Conclusion

As children diagnosed with ToF grow up to the teenage stage, there is a need for them to understand the manner in which their heart functionalities differ from those with normal hearts. There is also a need for these children to know the forms of defects they have and the manner in which they are treated, as well as the type of needed care. Therefore, the process of handling teenagers and adults diagnosed with ToF will seek to enable the groups to recognize signs and symptoms and the respective response mechanisms that could ameliorate potential adversities that may threaten to escalate the problem. The designed treatment plan for this group is that which will involve working with the health care providers of these children to compile packets of medical information and records covering their heart defects' aspects in entirety.

Specific data to be consulted will include surgeries or procedures, diagnoses, prescribed medicines, health insurance, and recommendations regarding the manner in which complications could be prevented and the resultant medical follow-up. Indeed, the health insurance plan needs to be reviewed to understand the coverage of these groups and foster the process of keeping these plans current. In situations where the adults plan to change their jobs, an effort needs to be made to determine whether the new health insurance will cater for congenital heart defects.

References

Al Habib, H. F. et al. (2010). Contemporary patterns of management of tetralo gy of Fallot: data from the Society of Thoracic Surgeons Database. *Ann Thoracic Surg*, 90(3), 813-819

Barron, D. J. (2013). Tetralogy of Fallot: controversies in early manag ement. *World J Pediatric Congent Heart Surg*, 4(2), 186-191

Fraser, C.D. & Carberry, K. E. (2012). Congenital heart disease. In: Townsend CM Jr, Beauchamp RD, Evers BM, Mattox KL, eds. *Sabiston Textbook of Surgery*. 19th ed. Philadelphia, PA: Elsevier Saunders

Kliegman, R. M., Stanton, B. F., St Geme, J. W. & Schor, N. F. (2016). Cyanotic congenital heart lesions. In: Kliegman RM, Stanton BF, St Geme JW, Schor NF, eds. *Nelson Textbook of Pediatrics*. 20th ed. Philadelphia, PA: Elsevier

Parker, S. E., Mai, C. T. & Canfield, M. A. et al. (2010). For the National Birth Defects Prevention Network. Updated national birth prevalence estimates for selected birth defects in the United States, 2004-2006. *Birth Defects Res a Clin Mol Teratol*, 88, 1008-1016

Webb, G. D., Smallhorn, J. F., Therrien, J. & Redington, A. N. (2015). Congenital heart disease. In: Mann DL, Zipes DP, Libby P, Bonow RO, Braunwald E, eds. *Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine*. 10th ed. Philadelphia, PA: Elsevier Saunders