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An Analysis of Tetralogy of Fallot and Implications for Bio-Medical Interventions

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Abstract
Occurring as a congenital heart defect, Tetralogy of Fallot (ToF) has been documented to be present at birth. Some of the symptoms of this defect include bluish color occurring on the skin, difficulty in breathing, loss of consciousness (occasionally), and limpness. Additional symptoms include easy tiring upon breastfeeding, finger clubbing, and heart murmur. Whereas the cause of this condition remains unknown, risk factors have been documented. The factors include mothers who use alcohol, diabetic mothers, mothers aged 40 and above, and those who are diagnosed with rubella during pregnancy. Behavioral problems have also been found to be profound in situations where children have undergone complex surgery or had repeat surgeries. Increased anxiety and feelings of inferiority forms outcomes associated with ToF and in educational contexts, these groups have been linked to aggressive behavior, delinquent behavior, attention problems, and social problems. Overall, ToF can be inferred to yield greater behavioral disturbance in children.

Keywords: Tetralogy, Fallot and Implications, Bio-Medical etc.

1 Introduction

An overriding aorta is a defect constituting ToF. An occurrence of this defect implies that the artery carrying oxygenated blood to the rest of the body arises above both ventricles, lying out of place. Notably, a healthy heart appears in such a way that the aorta is just above the left ventricle. When an overriding aorta occurs, blood low in oxygen flows into the aorta and out to the rest of the body, rather than flow to the pulmonary artery for further pumping to the lungs for purposes of oxygenation (Barron, 2013). If ToF goes untreated, additional problems could include high pressure on the heart's right side (causing arrhythmia or irregular heartbeat), higher risks for endocarditis (infections of the heart's inner layer), and seizures, fainting, or dizziness. This paper focuses on the diagnosis of ToF through delivery, admission to the nursery and discharge home, as well as an evaluation of some of the resultant disruptions, test methods, and a treatment plan. The following figure illustrates a heart appearance or presentation in situations where patients are diagnosed with ToF.

2 Methodology

According to Fraser and Carberry (2012), the diagnosis of congenital heart defects is achieved via echocardiography. The technique has been observed to involve radiation and is quick, specific, and can be conducted prenatally. Prior to the arrival of more sophisticated techniques, the definitive approach responsible for the diagnosis of ToF was the use of chest X-rays. As documented by Parker, Mai and Canfield et al. (2010), the presence of a boot-like or *Coeur-en-sabot* in hearts with ToF is classically visible using chest X-ray procedures. However, a majority of infants are unlikely to show this finding, even if they have tetralogy. An additional classical finding in tetralogy is indicated by the absence of interstitial lung markings. These markings are usually secondary to pulmonary oligemia. Results from tests and procedures, physical exams, and the signs and symptoms of a baby are also used by doctors to diagnose tetralogy. Physical exams include listening to the lungs and heart of the baby via the use of a stethoscope, looking for heart defect signs (such as rapid breathing and a bluish tint to the fingernails, lips, and skin), and looking at the general appearance of the baby. According to

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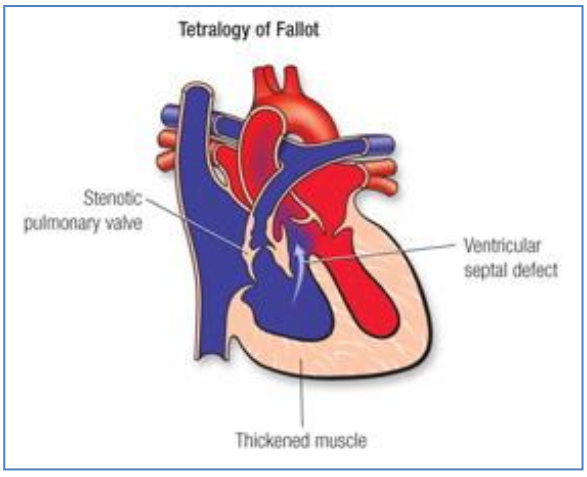
Webb, Smallhorn, Therrien and Redington (2015), DiGeorge syndrome is a predictor of ToF in some children and is evidenced by characteristic facial traits in terms of wide-set eyes.

3 Results and Analysis

To diagnose ToF, several tests are recommended by doctors. The role of tests and procedures lies in their capacity to provide data regarding ToF and how serious the four heart defects are.

Echocardiography: This procedure refers to a painless test in which sound waves are used for purposes of creating moving pictures of the heart. As the test is conducted, ultrasound or the sound waves bounce off the heart's structures. In turn, computer systems are used to convert the resultant sound waves into pictures that are eventually displayed on a screen (Kliegman, Stanton, St Geme and Schor, 2016). Therefore, this technique enables physicians to clearly identify any problem with the manner in which the heart works or is formed. According to Barron (2013), echocardiography is important in diagnosing ToF because it stretches beyond the highlight of the four conditions to indicate the manner in which the heart of the patient reacts to the conditions. In turn, the data collected enables echocardiologists to decide the type of surgery to use and when to repair the respective defects. It is also worth indicating that the procedure aids in the follow-up or further monitoring of the condition of the child after repairing the defects. In a related study, Al Habib et al. (2010) documented that echocardiography takes advantage of echocardiograms to use high-pitched sound waves for purposes of producing images of the heart.



Electrocardiogram: This simple and painless test seeks to record the electrical activities of the heart. Specifically, this procedure aims at showing the rate of the heartbeat and its resultant rhythm (whether irregular or steady). Furthermore, electrocardiograms record the timing and strength of electrical signals passing through the heart to enable doctors to determine the possibility of a presence of enlarged right ventricles; often referred to as ventricular hypertrophy (Fraser & Carberry, 2012). While recording the electrical activity of the heart, electrodes or patches with wires are placed on the ankles, wrists, and chest of the baby to record the results on paper. The role of the procedure lies in the determination of whether the baby's lungs' and heart's structures are enlarged (right ventricular hypertrophy). In addition, the procedure determines if the rhythm of the heart is regular and whether the right atrium of the baby is enlarged (Parker, Mai & Canfield et al., 2010).

In some cases, ToF is a syndrome and yields complications such as 22q11 deletion syndrome or Down's syndrome. Additional problems include frequent infections, behavioral problems, delayed speech and/or walking, growth retardation, and a very fast heart rate (Parker, Mai & Canfield et al., 2010). Additional observations suggest that children with ToF are more likely to suffer from infective endocarditis, a rare disease. Many children with ToF have also been found to do things that remain out of character or act out, especially in situations where social support is lacking (Webb, Smallhorn, Therrien & Redington, 2015). Behavioral problems have also been found to be profound in situations where children have undergone complex surgery or had repeat surgeries. Increased anxiety and feelings of inferiority forms outcomes associated with ToF and in educational contexts, these groups have been linked to aggressive behavior, delinquent behavior, attention problems, and social problems (Kliegman, Stanton, St Geme and Schor, 2016). Overall, ToF can be inferred to yield greater behavioral disturbance in children.

4 Conclusion

ToF has been linked to Down syndrome. The four classic defects falling in the ToF category include an overriding aorta that allows blood from the two ventricles to enter the individual's aorta, right ventricular hypertrophy that refers to the right ventricle's enlargement, pulmonary stenosis that is characterized by the right ventricle's narrowing of the exit, and the ventricular septal defect that constitutes a hole between the two ventricles.

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