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UNOPERATED TETRALOGY OF FALLOT: A CLINICOPATHOLOGIC STUDY OF A 12 MONTHS CHILD AT RIMS MEDICAL COLLEGE AND RESEARCH CENTRE, KADAPA

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Article Info	ABSTRACT		
Received 29/01/2020	Tetralogy of fallot is a congenital cardiac malformation that consists of an interventricular		
Revised 19/02/2020	miscommunication. This combination of lesions occurs in 3 of every 10,000 live births and		
Accepted 18/03/2020	accounts for 7–10% of all congenital cardiac malformations. It is a condition caused by a		
	combination of defects in all the 4 heart chambers that are present at birth. These defects		
Key words:-	affect the structure of heart, cause oxygen poor blood to flow out of the heart and to the rest		
Tetralogy of fallot,	of the body. Infants and children with TOF usually have blue tinged skin. Prevalence rate		
Emergency care,	of TOF is 3.5% affecting males and females equally. Pneumonia is an infection of lungs		
Pulmonary cyanosis,	that inflames air sacs in one or both lungs. The air sacs may fill with fluid or pus causing		
Heart murmurs.	cough with phlegm, fever and chills. It is most common in infants and young children and		
	people with weakened immune system. A 12 months' female child with this congenital		
	heart defect and pneumonia was discussed in this report. However most of the children		
	with TOF needs surgery, but timings may vary depending on the condition and severity.		
	This is important to note that surgery for TOF is palliative but not curative. This report		
	concludes that there is a need to increase awareness of TOF so as to encourage early		
	diagnosis and therefore promotes better outcomes.		

INTRODUCTION

Tetralogy of Fallot is a congenital heart defect that occurs at birth. TOF was 1st described by Niels Stenson, Danish anatomist in 1672. Sandifort Edward describes the symptoms and anatomical findings of TOF in a child in 1777 [1]. Significant congenital heart disease may be diagnosed virtually at any age but some conditions are discovered in rarely identified in infants[2]. It is one of the most common cause of cyanotic congenital heart diseases.

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It accounts for 7% to 10% of all congenital cardiac lesions and affects males and females equally[3]. Prevalence of TOF is 3.5% and the child born with TOF in these days can expect to survive to adulthood because of advances in the surgical treatment[4]. Congenital heart disease is a gross structural abnormality characterised by ventricular septal defect (VSD), over-riding aorta, pulmonary stenosis and hypertrophy of right ventricle. Tetralogy of Fallot has many causes. The major cause is chromosomal abnormalities accounts for 25% of cases of child with TOF. It includes triosomes 13, 18, 21 and 22q 11.2. Among these most common abnormalities are triosomes 21 and 22q 11.2. Moreover, other causes are family history, Di george syndrome⁵. The common risk factors associated with TOF

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includes viral infections, measles during pregnancy and maternal intake of retinoic acid in 1st trimester, untreated phenylketonuria and poorly controlled diabetes mellitus in pregnancy[5].

How-ever onset of symptoms and severity depends on degree of RVOTO. In mild cases, the patient is asymptomatic and acyanosed. The only finding present in such cases is systolic murmur. In case of severe obstruction, marked cyanosis may be present which requires medical intervention. Signs and symptoms become more apparent as the infant grows older. Along with the cyanosis, respiratory distress and hyper-cyanotic spells (TET spells) may also present. These TET spells are life threatening and may be fatal which requires intervention. It occurs as a result of spasm of right outflow tract. Feeding, crying and exertion are the precipitating factors of TET spells.

The pathology of TOF includes conal septum is displaced anteriorly. This displaced conal septum protrudes into the pulmonary outflow tract, which may result in obstruction and blockage of downstream structures including the pulmonary valve, main pulmonary artery and branch pulmonary arteries. Systolic pressure in the left and right ventricles and in the aorta are same because ventricular septal defect is large. The extent of condition depends on the degree of right ventricular outflow obstruction. This obstruction may result in a net left to right shunt through the VSD, and a severe obstruction leads to a right to left shunt resulting in low systemic arterial saturation. TOF is majorly confirmed by echocardiography. Clinical diagnosis requires past history, clinical examination. Chest X-ray is done to identify boot shaped heart. Right ventricular hypertrophy can be identified by ECG. Cardiac catheterisation can be done in case of suspicion of any coronary anomaly. TOF condition is manageable by medication and surgery. The mode of management depends on type and degree of right outflow obstruction. In case of critical pulmonary stenosis, prostaglandin infusion (0.05-0.1mcg/kg/min IV) is given to increase pulmonary outflow of blood. Surgical intervention is necessary in case of severe right ventricular outflow. It includes intra-cardiac repair and shunt/bypass surgery⁶. For treating TET spells, calm the child and provide supplemental oxygen and infuse IV fluids for volume expansion. If the spell persists, standard therapy should be followed. It includes beta blockers (propranolol or esmolol), morphine, phenylephrine, intranasal midazolam and intranasal fentanyl.

Pneumonia

Pneumonia is a respiratory condition in which there is an infection of the lungs that inflames the air sacs. Globally, pneumonia sustains as the leading cause of death of children under 5 years. According to WHO report, pneumonia accounts for 120 million cases every year, among which 14 million cases were severe⁷. Pneumonia is caused by variety of organisms. The most common causes are bacterial (streptococcus pneumonia, mycoplasma), virus (flu virus, adeno virus, parainfluenza virus, respiratory syntical virus), fungus (pneumocystis jiroveci). The group of people who are at risk of long term morbidity and mortality are infants (low birth weight or premature), those people who are immunocompromised, and those who have other conditions like cystic fibrosis and congenital heart disease. Child can present signs and symptoms at different stages of illness. Clinical presentation of pneumonia include fever, cough, tachyponea, wheezing, abdominal pain, lethargy. Other signs of pneumonia are chest indrawing, nasal flaring, cyanosis, breathing difficulty, feeding less than half of normal intake, signs of dehydration. A temperature of $> 38.5^{\circ}$ C is a characteristic feature of bacterial pneumonia[6-8].

Pathology of pneumonia starts with invasion of lower respiratory tract by inhalation, aspiration of pathogens. In order to counteract the pathogens, the barrier to infection anatomical structures like nasal hairs, cilia, epiglottis and cell mediated, humoral immunity activated. As a result of these, nasopharyngeal colonization occurs which leads to inflammation or injury or death of surrounding epithelium and alveoli. The migration of inflammatory cells to the site of infection causing an exudative process that impairs oxygenation[9]. A number of different laboratory tests ate used currently in combination with clinical assessment to diagnose pneumonia. White blood cells (WBC count), C – Reactive Protein (CRP), Erythrocyte sedimentation rate (ESR) are generally used as a markers of infection, but they don't help in distinguishing between bacterial, viral or mixed pneumonia. Blood cultures are taken if suspected to have bacterial pneumonia. Polymerase Chain Reaction (PCR) enhances the identification of specific organism, but it is not widely available, expensive and routine use is not recommended. Viral immune-fluorescence and viral antigen detection can be done by nasopharyngeal aspirate which is useful in identifying virus[10].

Chest-X ray is still considered as a golden standard for diagnosing pneumonia. Generally, it is not possible to identify the exact cause of pneumonia in the clinical practice. This is because of co-infections of bacteria and virus which cannot be distinguished from infection due to a single pathogen. Hence antibiotic therapy is prescribed for all the children. The main goal of treatment is to reduce the risk of morbidity and mortality of pneumonia as cheaply as possible. In severe pneumonia, the recommended 1st line benzyl drugs are penicillin, amoxicillin and chloramphenicol. In case of very severe pneumonia, ampicillin or amoxicillin plus gentamicin are recommended¹¹. Amoxicillin is the 1st choice for children < 5 years old through oral route, alternative are co-amoxiclay, cefaclor, erythromycin, clarithromycin, and azithromycin. Currently resistance of S. pneumonia to penicillin is



increased. So macrolides are prescribed along with it. The BTS guidelines suggested that antibiotics administered orally are safe and effective and IV antibiotics are preferred for children with severe signs and symptoms. Generally oral antibiotics are prescribed for 5-7 days but treatment duration is increased to 10 days based on severity of disease and antibiotic. The major complications of pneumonia are treatment failure, pleural effusion, emphysema, lung abscesses, septicaemia etc. The hospitalisation and mortality of pneumonia can be reduced by conjugate vaccines against Haemophilus influenza type b and streptococcus pneumonia[11,12].

A CLINICO-PATHOLOGIC STUDY:

A 12 months' female child patient weighing 4.5kgs, resident of kadapa was admitted in PICU ward presented with chief complaints of fever, cough, cold and breathlessness since 4 days. The patient's mother noticed bluish discoloration of fingers, toes, lips during irritability and excessive crying. Past medication history of the patient includes, TOF was observed immediate after 10 days of birth. Past medication history includes Tab. Propranolol 4mg TID at the age of 9 months. In addition, patient was prescribed with Syrup. Digoxin 12.5µg (0.25ml) BD since 1 month. Patient was immunized up to the age as per

schedule. She was born of a full term cesarean delivery in the hospital without any peripartum complications but with low Birth weight of 1.77kgs and not cried immediately after birth. Personnel history includes weight – 4.5kgs, abnormal sleep, bowel & bladder habits were normal, appetite was normal. There was no history of similar illness in the family.

On examination, the patient was found to be conscious, coherent and cooperative. She was comfortable at rest. The Pulse rate was 118 /min, respiratory rate was 62cpm, temperature was 100°F. The digits of all four limbs and lips are cyanosed and a saturation of 58%. On cardiovascular examination, S1 and S2 were normal. Pan-systolic murmur was heard, loudest. On respiratory examination bilateral coarse crepts also present. Chest X-Ray report shows consolidation in both lungs at basal fields and liver was not palpable. 2D Echo reveals double outlet right ventricle, tetralogy of fallot, straddling of tricuspid valve, mild to moderate hypo-plastic left ventricle. During the treatment course, the patient oxygen saturation was reduced day by day from 70% to 35%.

Gradually the patient condition became worsening and dobutamine infusion Of 1.35cc was given on day 18, 19. The patient passed away on day 20 without undergoing surgical intervention.

Drug Name	Dose	ROA	Frequency	Duration (Days)
Inj. Piptaz	500mg	IV	TID	1-17
Inj. Amikacin	40mg	IV	OD	1-17
Syp. Ambroxol	1ml	p/o	TID	2-15
Syp. Paracetamol	2.5ml	p/o	TID	1-3
Neb Budecort	0.3mcg	Nasal	12 th hrly	1-17
O ₂ Inhalation	5L/Min	Nasal	SOS	1-20
Furoped drops	0.5ml	p/o	BD	1-20
Isolyte – P	150ml	IV	TID	1-14

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DISCUSSION

This is a case of an infant with tetralogy of fallot and bronchopneumonia. Generally, the diagnosis and clinical management of TOF requires multidisciplinary team that includes a paediatrician, paediatric cardiologist, cardiac surgeon, radiologist and pharmacist. However most of the children with TOF needs surgery, but timings may vary depending on the condition and severity¹³. This patient undergone symptomatic therapy for TOF and hypercyanotic spells since 10 months and patient passed away at the age of 12 months. She does not undergo any intervention. There is 75% mortality rate for child with TOF without any intervention and 70% survival rate for child with TOF who undergone corrective surgery either in childhood or adulthood[13].

In US, infants born with TOF undergoes primary repair within 1st year of life and outcomes were good but after 20 years majority people need pulmonary valve replacement. Nowadays percutaneous method of implanting pulmonary valve is available in which child is free from

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symptoms but the long term results were unknown. This is important to note that surgery for TOF is palliative but not curative¹. This case demonstrates the challenges faced by the child with cyanotic congenital heart disease without any intervention. Hence this report concludes that there is a need to increase awareness of TOF so as to encourage early diagnosis and therefore promotes better outcomes. However, pharmacist also play a role in management of TOF by reducing medication errors, drug-drug interaction, improvement of usage of guideline driven therapy and promotes medication adherence [14].

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