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Short Communication

Transposition of great arteries (TGA)

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Abstract

"Transposition of the great arteries (TGA)" refers to a condition where the two major arteries, the aorta and the pulmonary artery, are affected. In TGA, these vessels originate from the incorrect ventricle, meaning they are switched from their usual location. The aorta emerges from the right ventricle, while the pulmonary artery arises from the left ventricle.

Transposition of the major arteries may be accompanied by other heart abnormalities. A ventricular septal defect (VSD) is in about 25% of children with transposition. In a third, the coronary arteries have an odd branching pattern. Narrowing beneath the pulmonary valve may also occur in infants. This prevents blood from entering the lungs from the left ventricle.

Transposition causes the pulmonary (to the lungs) and systemic (to the body) circulations to function in tandem rather than in tandem. This indicates that the aorta and the body receive the oxygen-poor ("blue") blood that has returned from the body and is flowing through the right atrium and right ventricle. The pulmonary artery sends the oxygen-rich ("red") blood back to the lungs after it has passed through the left atrium and ventricle.

The body's organs will not receive the oxygen they require unless there is a location in the circulation where the blood that is oxygen-rich and blood that is oxygen-poor can combine. The blood must mix someplace in the heart in order to survive before surgery. A ventricular septal defect (VSD) will be mixing if it is present. This prevents adequate mixing. Mixing can also happen through a patent ductus arteriosus (PDA) or an atrial septal defect (ASD).

Keywords: Transposition of great arteries (TGA), Atrial septal defect (ASD), Patent ductus arteriosus (PDA)

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1. Introduction

The two major arteries that leave the heart are inverted, or transposed, in transposition of the great arteries (TGA), a dangerous and uncommon cardiac condition. Congenital heart defects are conditions that exist from birth. The big veins that carry blood from the heart to the lungs or the body are not correctly connected because to the fetal heart's aberrant growth during the first eight weeks of pregnancy.[1]

1.1. Etiology and risk factors

The cause of great artery transposition is unknown, but it is thought to be complex.

Infants of moms with diabetes are more likely to have this congenital cardiac abnormality. There are two types of transposition of the great arteries:

1.2. Complete transposition of the great arteries (D-TGA)

The aorta and pulmonary artery have switched places in a full transposition of the great arteries, also known as a dextro-transposition of the great arteries. The left ventricle is connected to the pulmonary artery, whereas the right ventricle is attached to the aorta.

As a result, blood with low oxygen content returns to the body via the right side of the heart instead of going via the lungs. Without being pumped to the rest of the body, oxygen-rich blood passes via the left side of the heart and returns straight to the lungs.[2]

1.3. Congenitally corrected transposition (L-TGA)

The two lower heart chambers (ventricles) are flipped in this less common form, which is also known as levo-transposition of the great arteries (L-TGA). On the right side of the heart, the left ventricle receives blood from the right atrium, while

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on the left side of the heart, the right ventricle receives blood from the left atrium. Normally, the blood passes through the body and heart in the proper manner. Whereas the left-sided right ventricle connects to the aorta, which transports oxygen-rich blood to the body, the right-sided left ventricle connects to the pulmonary artery, which sends blood with low oxygen content to the lungs. Due to the differences between the two chambers, the heart may have chronic problems pumping blood. The tricuspid heart valve may also be problematic for those with L-TGA.[2]

2. Risk Factors

A history of German measles (rubella) or another viral disease in the mother during pregnancy, as well as alcohol consumption or drug use during pregnancy, can all raise the likelihood of a baby being born with transposition of the great arteries. Smoking during pregnancy and the mother's poorly managed diabetes during pregnancy.[3]

3. Pathophysiology

(The pulmonary and systemic circulations function in parallel, rather than in series) Causes Transposition of great arteries

↓

Oxygenated pulmonary venous blood returns to the left atrium and left ventricle

↓

Re circulated to the pulmonary vascular bed via the abnormal pulmonary arterial connection to the left ventricle.

↓

Deoxygenated systemic venous blood returns to the right atrium and right ventricle pumped to the systemic circulation, effectively bypassing the lungs

↓

Deficient oxygen supply to the tissues and an excessive right and left ventricular workload

↓

It is incompatible with prolonged survival unless mixing of oxygenated and deoxygenated blood occurs at some anatomic level like ASD, VSD, PDA.

4. Clinical Manifestations

Signs of transposition of the great arteries may be detected during certain routine screening tests done during pregnancy. However, some people with congenitally corrected transposition of the great arteries may not have symptoms for many years. Signs and symptoms of transposition of the great arteries after birth include:

1. Blue colour of the skin (cyanosis)
2. Shortness of breath
3. Weak pulse
4. Lack of appetite
5. Poor weight gain

4.1. Assessment and diagnostic studies

1. History Taking
2. Physical Examination
3. Electrocardiography
4. Chest X- ray
5. Echocardiography
6. Cardiac catheterization.

5. Management

1. **Palliation:** Insufficient mixing of the two venous returns causes hypoxia, one of the main symptoms of new-borns with transposition of the great vessels. Palliation aims to improve mixing in two ways.

2. **Intravenous prostaglandins (prostaglandinE1):** Intravenous prostaglandins, such as prostaglandin E1, help to promote mixing and open or maintain the ductus arteriosus.

3. **Balloon atrial septostomy:** An operation known as balloon atrial septostomy may be carried out as part of cardiac catheterization in order to enhance the mixing of oxygen-rich (red) and oxygen-poor (blue) blood. The atrial septum, or wall between the left and right atria, is opened using a specialized catheter with a balloon at the tip. The catheter is inserted into the left atrium through the foramen ovale, a tiny hole in the atrial septum that closes soon after birth. The balloon has blown up. Blood can mingle between the atria when the catheter is swiftly drawn back through the opening and into the right atrium, widening the hole.[4]

6. Surgical Management

1. **Atrial septostomy:** As a short-term remedy, this catheter technique may be performed immediately. A natural connection between the heart's top chambers (atria) is widened by the surgery, which is also known as balloon atrial septostomy. It increases the amount of oxygen delivered to the baby's body by mixing blood that is oxygen-rich and blood that is oxygen-poor.[5]

2. **Arterial switch operation:** The most popular procedure for repositioning the great arteries is arterial switch operation. An arterial switch

operation involves moving the aorta and pulmonary artery to their proper locations. The left ventricle is connected to the aorta, and the right ventricle is attached to the pulmonary artery. Additionally, the heart arteries are rejoined to the aorta.[4]

3. **Rastelli procedure:** If a baby has a ventricular septal defect with transposition of the great arteries, this treatment might be suggested. In order to allow the body to receive oxygen-rich blood, the surgeon uses a synthetic patch to seal the hole (septal defect) in the heart and reroute blood flow from the left ventricle to the aorta. There is an interruption in the link between the pulmonary artery and the left ventricle. After that, an artificial valve is used to link the right ventricle to the pulmonary artery, which is attached to the lungs.[4]

4. **Double switch procedure:** Double switch procedure: Congenitally corrected transposition is treated with this intricate surgical technique. In order to position the left lower heart chamber (ventricle) to pump oxygen-rich blood to the aorta, it reroutes blood flow entering the heart and changes the connections between the main arteries.

5. **Mustard or Senning surgery:** The surgeon may decide to do an atrial switch operation known as a Mustard or Senning operation if the infant is older at the time of diagnosis or if one of the coronary arteries is located in an unusual way. The heart/lung bypass machine is utilized for this procedure. Instead than changing the arteries that take blood out of the heart, the venous drainage of blood entering the heart is redirected.[4-6]

Long-term complications of the Mustard procedure:

1. Systemic heart failure Arrhythmias
2. Venous return stasis
3. Pulmonary edema
4. Sudden death

6.1. Complications

1. Congestive heart failure
2. Arrhythmia
3. Eisenmenger syndrome (irreversible and progressive pulmonary vascular obstructive disease).

Prognosis: After arterial switch surgery, 90% of patients survive. Although the overall death rate after an atrial level switch is modest, there is a considerable long-term morbidity linked to atrial bradyarrhythmia and tachyarrhythmias, systemic atrioventricular (tricuspid) valve regurgitation, and systemic (right) ventricular dilatation and failure.

7. Nursing Management

1. **Nursing Diagnosis**: Decreased Cardiac Output related to structural factors of congenital heart defect evidenced by variations in hemodynamic readings (hypertension, bounding, pulses, tachycardia, specify values)

2. **Desired Outcomes**: Patient demonstrates adequate cardiac output as evidenced by blood pressure and pulse rate and rhythm within normal parameters for patient; strong peripheral pulses; and an ability to tolerate activity without symptoms of dyspnea, syncope, or chest pain.

7.1. Nursing interventions

1. Note skin colour, temperature, and moisture.
2. Check for peripheral pulses, including capillary refil1.
3. Asses for reports of fatigue and reduced activity tolerance.
4. Inspect fluid balance and weight gain. Weigh patient regularly prior to breakfast.
5. Assess heart sounds for gallops (S3, S4).
6. Monitor electrocardiogram (ECG) for rate, rhythm, and ectopy.
7. Provide adequate rest periods
8. Position child in semi-Fowler's position

2. Nursing Diagnosis: Activity Intolerance related to generalized weakness or Imbalance between oxygen supply and demand **evidenced by**

1. Presence of circulatory/respiratory problem
2. Verbal complaint of fatigue or weakness
3. Abnormal heart rate or blood pressure response to activity
4. Exertional dyspnea

7.2. Desired outcomes

Patient will tolerate increased activity.

8. Nursing Intervention

1. Evaluate the degree of exhaustion and the capacity to carry out ADLs and other tasks in light of the condition's severity.
2. Examine skin color variations during rest and activity, as well as dyspnea upon exercise.
3. Give people time to relax in between treatments; only interfere when it's required for operations or care.
4. Use a soft, cross-cut nipple to feed the baby instead of letting them wail for extended periods of time. If the baby can't consume enough calories through their mouth, gavage-feed them.
5. Help parents schedule their time for care and relaxation.

6. Notification of activity or exercise limitations and the ability to establish personal activity and exercise goals.

8.1. Nursing diagnosis

Compromised Family Coping related to Situational and developmental crises of family and child evidenced by

1. Family expresses concern and fear about infant/child's disease and condition
2. Displays protective behavior disproportionate to need to grow and develop
3. Chronic anxiety and possible hospitalization and surgery

8.2. Desired outcomes

Family will cope more effectively.

8.3. Nursing interventions

1. Keep an eye out for unpredictable behaviours (stress, fury, disarray), as well as a sense of a crisis.
2. Evaluate the efficacy of the family's typical coping mechanisms.
3. Promote emotional expression and give accurate information about a young child.
4. Lessens anxiety and improves family comprehension of the illness.
5. Evaluate the need for assistance and information.
6. Address any misunderstandings and respond to inquiries about the illness process.
7. Help in recognizing and putting into practice coping mechanisms, problem-solving strategies, and situational management.

9. Nursing Diagnosis

Risk for Injury related to Cardiac function compromised by congenital defects and medication administration

9.1. Desired outcomes

Patient will not experience injury.

9.2. Nursing Interventions

1. Evaluate for the possibility of medication toxicity, a heart failure cardiac complication.
2. Help and encourage the family's emotions and surgical decision.
3. Get the kid and parents ready for diagnostic tests and/or surgery (using a play doll); this should be thorough, consistent, and complete, including the surgical operation to be performed, the expected outcomes, the prognosis, and whether it is corrective, palliative, temporary, or permanent
4. Give instructions on how to administer cardio tonics, including when to withhold the apical pulse (less than 70–80 in children and 90–100 in infants), and how to alert the doctor to low or irregular pulses, which are indicators of toxicity.

Nursing Diagnosis: Risk for Infection related to Chronic illness

9.3. Desired outcomes

Patient will not experience any infection.

9.4. Nursing Interventions

1. Check for elevated WBC, elevated pulse, elevated respirations (indicate when), temperature, and IV site, if present.
2. Provide for age-appropriate rest and dietary requirements.
3. Before providing treatment, wash your hands.
4. Give antibiotics as directed (indicate the medication, dosage, timing, and method).
5. Teach parents and kids about personal hygiene and habits (food, exercise, relaxation, restroom for voiding, bathing).
6. Advise against interacting with family members or acquaintances who are infected.

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None.

11. Conflict of Interest

None.

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