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Case Study on Postoperative Management of Arterial Switch Operation

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ABSTRACT: Transposition of the Great Arteries (TGA) is a life-threatening congenital cardiac anomaly that accounts for 3% of congenital heart diseases and 20% of cyanotic heart conditions. The arterial switch operation (ASO) is the definitive surgical correction performed in the neonatal period. This case study describes the postoperative management of a neonate with antenatally diagnosed TGA, born to a mother with gestational diabetes and hypothyroidism. The baby underwent an ASO (Arterial switch operation) with postoperative complications including pleural effusion and failed early extubation, requiring reintubation and peritoneal dialysis. Postoperative nursing management focused on pain control, thermoregulation, hemodynamic stability, respiratory support, fluid and electrolyte balance, infection prevention, skin integrity, nutritional rehabilitation, and parental counselling. Through vigilant assessment, prompt interventions, and multidisciplinary collaboration, the neonate achieved stable hemodynamic status, tolerated oral feeding, and was successfully discharged home on room air with satisfactory weight gain. This case highlights the pivotal role of postoperative nursing care in ensuring recovery and preventing complications after complex neonatal cardiac surgery.

KEYWORDS: Transposition of great arteries, Arterial switch operation, Post operative cardiac management, congenital heart defects.

I.INTRODUCTION

The arterial switch operation (ASO) is the gold standard surgical procedure for correcting Transposition of the Great Arteries (TGA) in neonates. TGA is a congenital heart defect where the two major arteries—the pulmonary artery and the aorta—are transposed, leading to parallel circulatory systems and severe hypoxemia if uncorrected.

II.PREVALENCE

TGA affects approximately 4.7 per 10,000 live births, representing 3% of congenital heart diseases and 20% of cyanotic congenital heart diseases. It occurs more commonly in males.

III.ETIOLOGY

While the exact etiology remains unclear, but TGA might associated with Genetic syndromes: Heterotaxy, Turner syndrome, DiGeorge syndrome**.** Maternal risk factors: Gestational diabetes, infections, use of antiepileptic drugs (AEDs), ibuprofen use, and conception via IVF.

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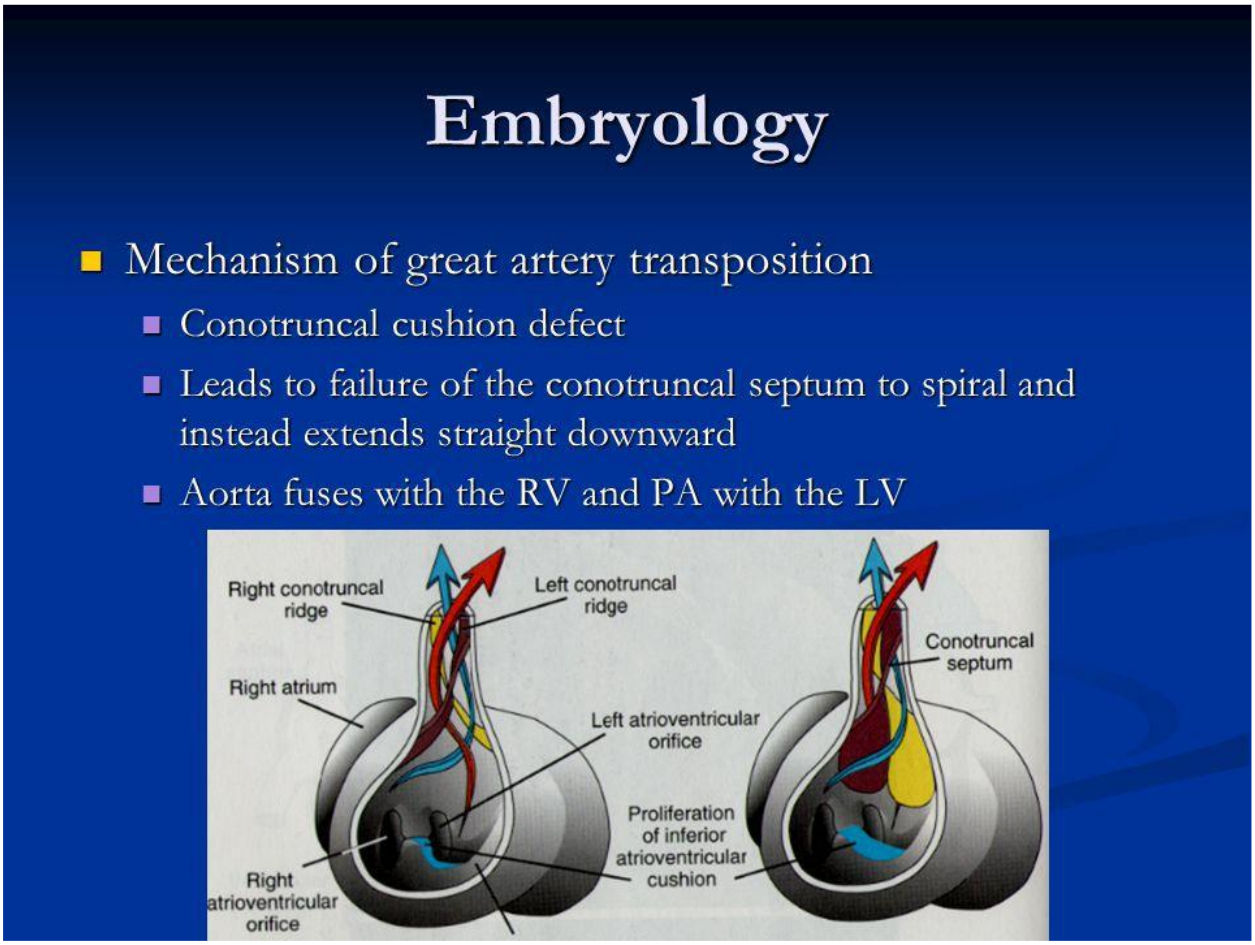
- 

IV.CASE DESCRIPTION

A new born was diagnosed antenatally with TGA via foetal echocardiography. The mother had a history of gestational diabetes and hypothyroidism (G2P1L1) and delivered via elective LSCS due to a prior caesarean.After birth, the neonate was shifted to the NICU for respiratory distress. The baby was started on CPAP and showed central cyanosis with oxygen saturation between 65–70%, but remained active and hemodynamically stable.A 2D ECHO on day 1 of life confirmed. TGA. Prostaglandin E1 (PGE1) infusion was initiated to maintain ductus-dependent circulation. Following a multidisciplinary meeting, the baby was scheduled for an arterial switch operation (ASO).

V.INVESTIGATIONS

Blood investigations was send for Complete blood counts, Liver function test,Kidney function test, Serology, Blood grouping and typing. All results were within normal limits.

A.Radiological Findings:
Chest X-ray showed Classic "egg on a string" appearance

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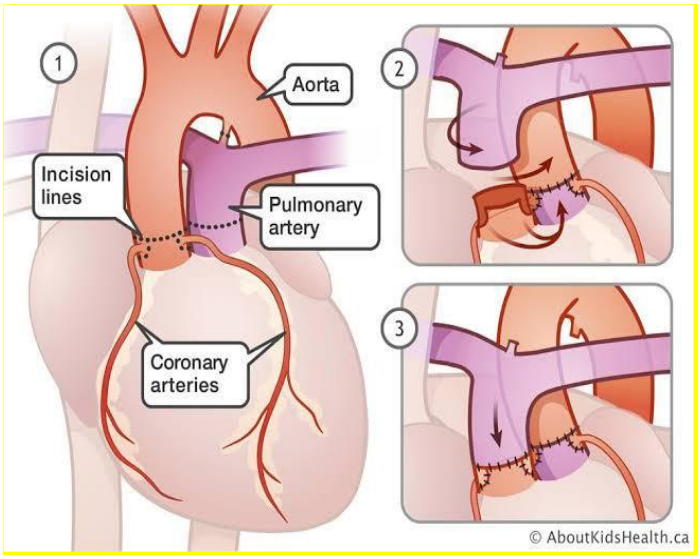
IJARSET IMPACT FACTOR 7.150

B. Echocardiography revealed Situs solitus,. Levocardia, AV concordance, D-transposition of the great arteries, Large PDA, Small secundum ASD, Normal coronary anatomy.

VI. SURGICAL PROCEDURE – ARTERIAL SWITCH OPERATION

Primary sternotomy and pericardiotomy were performed. Patient was placed on cardiopulmonary bypass (CPB). PDA (Patent ductus arteriosus) dissected and ligated. Cardioplegia administered; aorta transacted and coronaries harvested. Neo-pulmonary artery reconstructed; coronaries anastomosed to the neo-aorta. Pulmonary artery anastomosed to the PA confluence. Rewarming started. Bilateral pleural drains, RV pacing wires, and peritoneal dialysis catheter placed *in situ*.



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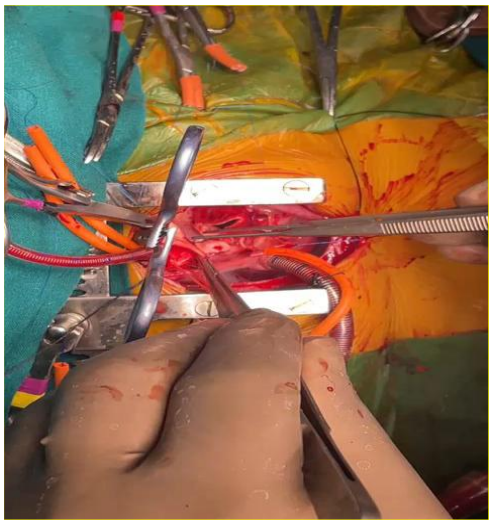

VII.POST OPERATIVE MANAGEMENT

On postoperative day (POD) 0, the sternum was left open, and the baby was managed on mechanical ventilation with vasoactive support, including vasopressin, noradrenaline, milrinone, and calcium gluconate. Sedation and paralysis were maintained using fentanyl and atracurium infusions. Sildenafil was initiated at a dose of 1.6 mg/kg/day for pulmonary hypertension. Broad-spectrum antibiotics (Piperacillin-Tazobactam and Teicoplanin) were administered. Supportive care included a 25% dextrose infusion and packed red blood cell transfusion at10mL/kg over 4 hours. Child had lines ane tubes include a nasogastric tube, pleural and pericardial drains, arterial and central venous lines, urinary catheter, peritoneal dialysis (PD) catheter, and pacing wires. PD cycling was initiated, and hemodynamic monitoring was continued and the vitals were heart rate 110–160 bpm, mean arterial pressure (MAP) 40–45 mmHg, and central venous pressure (CVP) 8–10 mmHg. The sternal site and drains were checked hourly, and a pacing backup was set at 100 bpm.On POD [Post operative day]1, sternal closure was performed under sedation. Trophic expressed breast milk (EBM) feeds were initiated via the nasogastric tube. Infusions of 20% albumin and furosemide (1 mg/kg/day) were started. On POD 2, PD was continued with all drains and lines maintained. Fentanyl and noradrenaline were tapered and discontinued. By POD 3, vasopressin was stopped while milrinone and sildenafil were continued. Chest physiotherapy was initiated. On POD 4, the baby was extubated but required reintubation within 2 hours due to respiratory distress and metabolic acidosis. Sedation was resumed, and the PD catheter was removed. On POD 5, ventilatory support was gradually reduced. Feeds were continued via the NG tube, and inotropic support along with furosemide infusion was maintained.On POD 6, a 2D echocardiogram revealed a large left pleural effusion. Paediatric surgery was consulted, and an intercostal drainage (ICD) tube was placed on the left side, draining 150 mL of serous fluid. Following stabilization, the baby was extubated and transitioned to high-flow nasal cannula (HFNC). Between POD 7 and 10, HFNC settings were gradually weaned. Oral sildenafil was initiated, and NG feeds were progressed to full volume. HFNC was eventually replaced with nasal prongs at 2 L/min. The furosemide infusion was stopped.ICD, and urinary catheter were removed. A successful room air trial was completed, antibiotics were stopped, and direct breastfeeding was initiated and well tolerated. Central venous access was also removed. By POD 11, the baby was hemodynamically and neurologically stable with room air oxygen saturations above 95%, feeding well, and showing no signs of surgical site complications. The patient was discharged in stable condition with a weight of 2.9 kg

VIII. NURSING MANAGEMENT

1.Ineffective Breathing Pattern Related to Postoperative Support:Respiratory status was monitored through rate, depth, oxygen saturation, and ABGs. Airway patency was ensured with suctioning and positioning, and humidified oxygen was administered as prescribed. Chest physiotherapy was continued, and ventilatory support was weaned gradually until stable room air breathing was achieved.

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2.Risk for Altered Tissue Perfusion:Perfusion was assessed by monitoring capillary refill, pulse volume, skin colour, urine output, and lactate. Vasoactive medications were titrated appropriately, normothermia maintained, and the infant repositioned regularly. Circulatory stability and adequate organ perfusion were thus maintained.
3.Acute Pain Related to Surgical Intervention:Pain was assessed using the Neonatal Infant Pain Scale (NIPS) along with observation of non-verbal cues. Continuous fentanyl infusion was given during mechanical ventilation, followed by oral analgesics post-extubation. Comfort was enhanced with non-pharmacological measures like swaddling, positioning, and pacifiers, which kept the infant calm and pain-free.
4.Risk of Hypothermia in the Newborn:Core temperature was monitored regularly, and the baby was managed under a servo-controlled warmer. IV fluids and blood products were pre-warmed, and exposure during procedures minimized. These interventions helped maintain normothermia with stable vital signs and warm extremities.
5.Risk of Decreased Cardiac Output Post-Surgery
Cardiac status was assessed through heart rate, blood pressure, CVP, perfusion, and lactate levels. Vasoactive agents such as milrinone, noradrenaline, and vasopressin were titrated as prescribed. Strict fluid management and a neutral thermal environment further supported stable cardiac output and perfusion.
6.Risk of Infection Due to Open Chest and Invasive Lines :Infection prevention bundles for VAP, CLABSI, CAUTI, and SSI were implemented with strict aseptic technique and 1:1 nursing care. Daily wound and line inspections ensured no signs of infection, with normal WBC and CRP values maintained.
7.Risk for Fluid and Electrolyte Imbalance: Strict intake–output charting, daily weights, and serum electrolyte monitoring were maintained. Diuretics and supplements were administered as prescribed, and fluids were adjusted according to tolerance. This prevented dehydration, overload, and electrolyte disturbances.
8.Impaired Oral Feeding Pattern Related to NPO(Nil per Oral) and NG Feeding:The transition from NG to oral feeds was gradual. Lactation support was given to the mother, and the infant was positioned correctly during feeding to prevent aspiration. Breastfeeding was successfully established, with steady weight gain confirming adequate nutrition.
9.Risk of Gastrointestinal Dysfunction Related to Cardiopulmonary Bypass:Abdominal girth, bowel sounds, and feed tolerance were closely monitored. The infant was initially NPO, followed by trophic NG feeds, which were advanced as tolerated. NG tube drainage was maintained when NPO, preventing feed intolerance and abdominal distension.
10.Imbalanced Nutrition: Less Than Body Requirements Related to Increased Metabolic Demands:The neonate's nutritional status was closely assessed through daily weights, serum albumin, and growth parameters. Early initiation of expressed breast milk via NG tube was prioritized, advancing to full enteral feeds as tolerated. Caloric intake was optimized to meet metabolic demands of recovery, preventing malnutrition.
11.Risk of Impaired Skin Integrity:The surgical site and pressure points were inspected regularly. Repositioning every two hours, application of emollients, and use of silicone gel pads prevented pressure injuries especially when the neonate was kept chest open. Lines and diapers were carefully secured to avoid constriction, maintaining intact skin integrity.
12.Parental Anxiety/Knowledge Deficit Related to Outcome: Parents' stress and understanding of the condition were assessed, followed by daily counselling sessions with the intensivist and nursing team. Clear and empathetic communication, along with teaching basic care skills like NG feeding and breastfeeding, increased parental confidence and involvement.
13.Rehabilitation Needs Related to Postoperative Recovery: Chest physiotherapy and postural drainage supported lung expansion and secretion clearance. Passive range of motion exercises were given to maintain tone and mobility. Parental interaction was encouraged to promote bonding and neurodevelopment.
14.Impaired Oral Feeding Pattern Related to NPO and NG Feeding
The transition from NG to oral feeds was gradual. Lactation support was given to the mother, and the infant was positioned correctly during feeding to prevent aspiration. Breastfeeding was successfully established, with steady weight gain confirming adequate nutrition.

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IX.FAMILY EDUCATION

Family education is an essential part of postoperative care in paediatric cardiac surgery to ensure continuity of care after discharge. Parents were guided about the importance of maintaining strict hand hygiene, proper wound care, and keeping the surgical site clean and dry to reduce the risk of infection. They were instructed to observe for warning signs such as fever, increased irritability, poor feeding, excessive sweating, difficulty in breathing, bluish discoloration, or decreased urine output, and to seek medical help promptly if any of these symptoms occur. Education also included proper administration of prescribed medications, especially diuretics, anticoagulants, or cardiac drugs, with emphasis on correct timing and dosage adherence. Nutritional guidance was provided, highlighting breastfeeding support, frequent small feeds, and monitoring daily weight gain. Parents were also educated about positioning and gentle handling to protect the sternum, gradual activity resumption, and the importance of follow-up visits and vaccinations. Emotional counselling was offered to reduce parental anxiety, enhance coping skills, and encourage their active involvement in care. The nursing team reinforced discharge instructions using simple language, demonstrations, and return demonstrations to ensure parental understanding and confidence in managing the infant at home.

X. DISCUSSION

Neonates undergoing arterial switch operation are at risk for multiple postoperative complications including low cardiac output syndrome, arrhythmias, pulmonary hypertension, pleural effusion, and infection. In this case, vigilant nursing monitoring detected early signs of fluid imbalance and respiratory distress, which allowed timely interventions such as peritoneal dialysis and intercostal drain placement. The episode of failed early extubation emphasized the importance of individualized weaning strategies in neonates with complex hemodynamic. Consistent pain management, infection control, and nutritional support were crucial in promoting stability and recovery. Comparable studies have shown that meticulous postoperative nursing care significantly improves survival and reduces morbidity in neonates after ASO. This case reinforces the integral role of critical care nursing in identifying complications early, implementing evidence-based interventions, and involving parents as partners in care.

XI.CONCLUSION

This case study highlights that successful recovery after arterial switch operation in neonates depends not only on surgical expertise but also on vigilant and holistic nursing care. Comprehensive nursing interventions addressing pain, hemodynamic stability, ventilation, infection prevention, nutrition, skin integrity, and parental education were crucial in achieving favourable outcomes. The neonate's eventual stabilization and successful discharge demonstrate the effectiveness of a multidisciplinary, nurse-led approach in managing complex congenital cardiac surgery cases.

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