

## Pediatric Post Operative Cardiac Intervention & Nursing Management of MVR+ Tricusped Valve Repair for RHD

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### Abstract

Rheumatic heart disease (RHD) remains one of the largest preventable burdens of disease in the world. It is perceived as a disease of childhood, acquired by streptococcal throat infection of the tonsillo-pharynx, leading to an inflammatory reaction that involves many organs, including the heart. However, cases in children of 5 to 14 years of age are likely to represent only 15% to 20% of all cases within all age groups of vulnerable populations. Rheumatic heart disease is the most common cause of multivalvular disease in developing countries. Unless aggressive and timely intervention in the form of valve replacement is pursued, the condition progresses rapidly to disability and death. Hemodynamic superiority and thromboresistance are the normal selection criteria for these prostheses, although the surgeon's experience, and the ease of insertion, availability and cost of the valve also play important roles. A strict adherence to optimal anticoagulation levels optimizes protection against thromboembolism and anticoagulation-related hemorrhage, and helps to provide the patient with a good quality life.

**Keywords:** Rheumatic Heart Disease; Valve Repair; Mitral Valve Regurgitation.

### Introduction

Rheumatic fever is an inflammatory disease which may develop after a Group A streptococcal infection (such as strep throat or scarlet fever) and can involve the heart, joints, skin, and brain.

It is an Acute Autoimmune Collagen disorder characterized by inflammatory lesions present in the connective as well as endothelial tissues especially heart layers, joint, skin, & CNS.

Rheumatic heart disease is damage to one or more heart valves that remains after an episode of acute rheumatic fever is resolved. It is caused by recurrent episode of ARF, where the heart has become inflamed. The valve can remain stretched or scarred, and the normal blood flow through damaged valve is interrupted blood may flow backward through stretched valves that do not close properly. When

heart is damaged in this way, the heart valves are unable to function adequately, and heart surgery may be required.

### *Incidence and Prevalence*

Rheumatic fever primarily affects children between ages 6 and 15 years and occurs approximately 20 days after strep throat or scarlet fever.

### *Etiology*

Streptococcal infection Group A  $\beta$  hemolytic streptococci. Gram positive bacteria having M-protein - it is a more antigenic.

### *Risk-Factors*

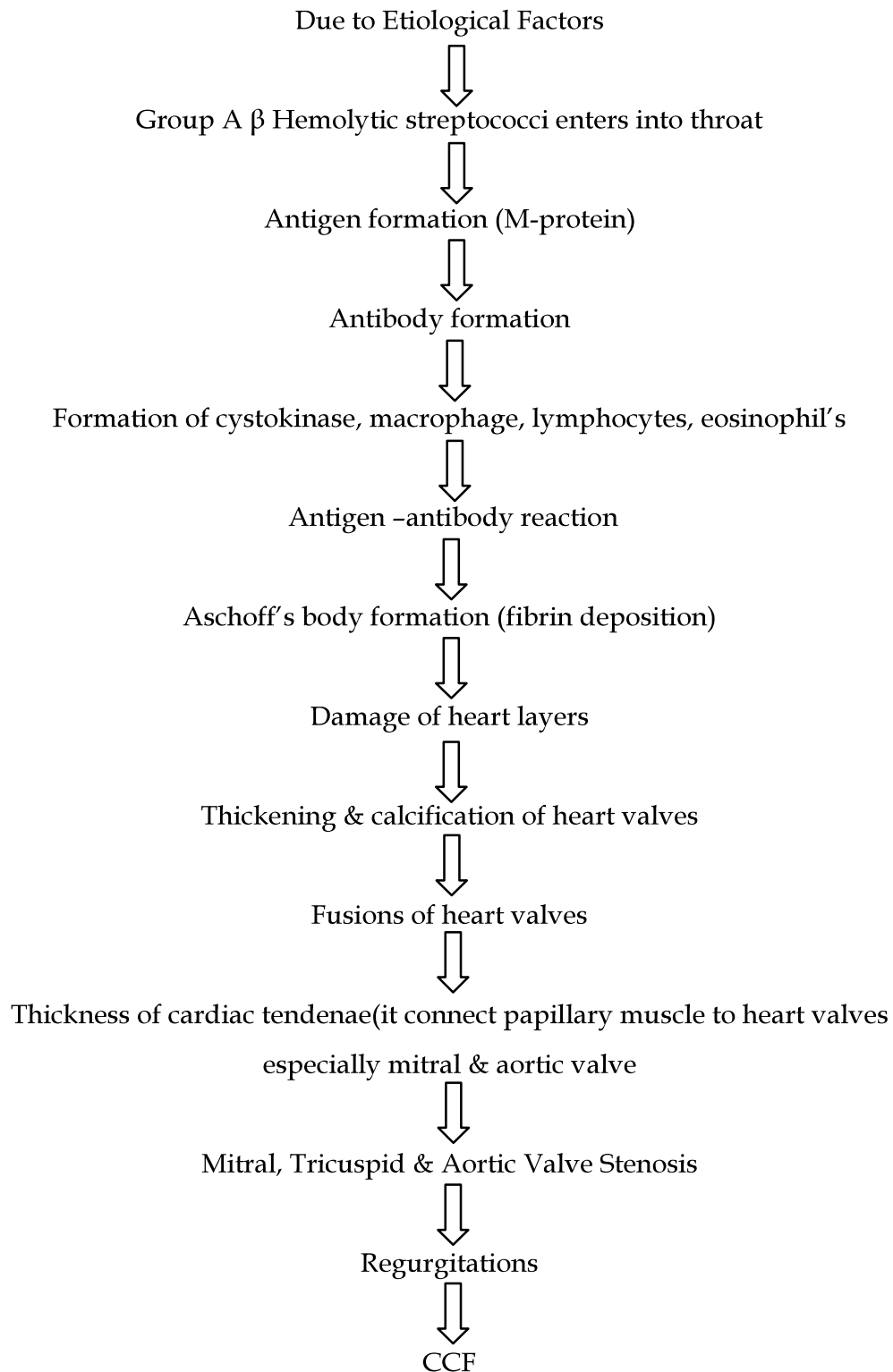
- Recurrent throat infection
- Upper respiratory tract infection

- Low socioeconomic status
- Over crowding

- Lack of environmental sanitation

### Pathophysiology of Rheumatic Fever

#### *Sign and Symptom*



*Jones Criteria for Diagnosing Rheumatic Fever*

The Jones criteria are used to standardize the diagnosis of rheumatic fever. Diagnosis requires that the patient have either two major criteria, or one major criterion and two minor criteria, plus evidence of a previous streptococcal infection.

| Major Criteria   | Minor Criteria   |
|--|--|
| Carditis<br>Migratory polyarthritits<br>Sydenham's chorea<br>Subcutaneous nodules<br>Erythema marginatum | Fever<br>Arthralgia<br>Elevated acute phase reactants<br>Prolonged PR interval |

*Major Criteria*

- *Carditis*: inflammation of the heart muscle which can manifest as congestive heart failure with shortness of breath, pericarditis with a rub, new heart murmur, Percardial effusion & chest pain.
- *Migratory Polyarthritits*: a temporary migrating inflammation of the large joints, usually starting in the legs and migrating upwards.
- *Subcutaneous Nodules* painless, firm collections of collagen fibers on the back of the wrist, the outside elbow, and the front of the knees. These now occur infrequently.
- *Erythema Marginatum*: A long-lasting reddish rash that begins on the trunk or arms as macules due to deposition of fat.
- *Chorea*: abnormal rapid involuntary jerkey movements seen all motor area. A characteristic series of rapid movements without purpose of the face and arms. This can occur very late in the disease for at least three months from onset of infection.

*Minor Criteria*

- Fever temperature elevation(101-102 F)
- Arthralgia: Joint pain without swelling
- Laboratory abnormalities: increased Erythrocyte sedimentation rate, increased C reactive protein, leukocytosis
- Electrocardiogram abnormalities: a prolonged PR interval
- Abdominal pain
- Nosebleeds

**Diagnosis**

- *History Collection*: About history of recurrent throat infection.
- *Physical Examination*: about major and minor criteria can examined by physician.

- *Laboratory Testing* may reveal an elevated white blood cell count and erythrocyte sedimentation rate during the acute phase.
  - ❖ Hemoglobin and hematocrit may show slight anemia due to suppressed erythropoiesis during inflammation.
  - ❖ C-reactive protein may be positive, especially during the acute phase.
  - ❖ Cardiac enzyme levels may be increased in severe carditis.
  - ❖ Antistreptolysin-O titer may be elevated in 95% of patients within 2 months of onset.
- *Throat Cultures* may continue to show the presence of group A beta-hemolytic streptococci; however, they usually occur in small numbers.
- *Electrocardiography* may show changes that are not diagnostic, but PR interval is prolonged in 20% of patients.
- *Chest X-Rays* may show normal heart size or cardiomegaly, pericardial effusion, or heart failure.
- *Echocardiography* can detect valvular damage and pericardial effusion, and can measure chamber size and provide information on ventricular function.
- *Cardiac Catheterization* provides information on valvular damage and left ventricular function.

*Management*

Children with rheumatic fever are often treated in the hospital, depending upon the severity of the disease.

Treatment for rheumatic fever, in most cases, combines the following three approaches:

**Treatment for Streptococcus Infection**

The immediate goal is to treat the infection with antibiotics (such as penicillin, sulfadiazine, or erythromycin). This is done even if the throat culture is negative. Following the initial treatment for strep infection, child may continue to receive monthly doses of antibiotics to help prevent further complications.

*High dose of Antibiotics*

- Procaine pencilline-4 lacks unit.
- Benzathine pencillin-1.2 mega unit
- Oral pencilline- 250 mg

### Anti-Inflammatory Medications

Based on the severity of child's condition, may prescribe medications to help decrease the swelling that occurs in the heart muscle, as well as to relieve joint pain. (corticosteroids. Salicylates)

- Methyl prednisolone-40-60 mg/day
- Aspirin-90-120/kg/day

Diazepam-1.2mg/kg/day

### Bed Rest

The length of bed rest will be determined by your child's physician, based on the severity of your child's disease and the involvement of the heart and joints. Bed rest may range from two to twelve weeks.

Some patients develop significant carditis which manifests as congestive heart failure. This requires the usual treatment for heart failure: diuretics, digoxin, and etcetera. Unlike normal heart failure, rheumatic heart failure responds well to corticosteroids.

### Diet

*Eat Plenty of*

- Fresh fruits and vegetables, foods with vitamin C, beta carotene and other anti-oxidant nutrients
- Poultry, seafood, wheat germ, and fortified cereals for vitamin E.
- Apples, or bran, and other foods high in soluble fibres

### Cut Down On

- Meat, especially fatty cuts.
- Eggs, whole milk, organ meats, and other high-cholesterol foods
- Fats, especially those that are saturated
- Iron-fortified foods (unless recommended by your doctor.)

### Avoid

- Tobacco in any form
- Salty foods (if you have hypertension.)

### Case Report

9 year old female child H/O RHD severe MR +TR

with CHF, severe anemia with Rt side pneumonia as well as child H/O fever / arthralgia/ /rsah /nodules came to hospital with complaints of pedal oedma 7-8 days, abdominal distension, dyspnea, peripheral cyanosis and cold skin. Echo was done child is having severe RV & moderate LV dysfunction than child admitted in cardiac unit vital signs are taken Heart Rate-88 b/mts, Respiratory Rate- 22 b/mts, Bp-84 /54 mm hg SP02-88%, S1 present but S2 inaudible and low rumbling diastolic murmur along the left sternal border also present. blood investigation done urea-115, creatine- 4.3, na-142 k-4.2, Ca- 8.4 Uric Acid-.6.3, Bilirubin-7.5, SGOT/SGPT-218/261 alkaline phosphate-212, HB-11.7 RBC-4.80 HCT - 34.4, TLC - 19.4, Platlet- 159, ESR- 28. Child received treatment INJ.cefotaxime 250mg iv tds, tab ciplar 10 mg, t.lasix 10mg bd, t.alldactone 15 mg od, tab.digoxin 0.125 mg than patient posted for surgery

- After surgery, this patient received with MVR+ TRICUPED VALVE REPAIR on Prvc FIO2 80% RR- 18 mts/ min ABG analysis done- PH- 7.33, po2- 75, pco2-48.7, Be- -3.6, HCO3-19.6, Na-140., K-3.33, ca- 1.0, Hb-12.5 Hct -37.5, Lac-4.6, Cl-105, vita signs are Bp-60/42 MmHg, HR-112 b/mts, RA-18, pherpheral temperature-26.3, core temperature. 40.7c, child received inotrops support, inj DOPA 200/50@3.Ml/hr, inj DOBUTAMINE 250/50@3.3 ml/hr, ADR 2/50@ 3.3mil/hr, NOR-ADR 2/50@ 4.2 mil/hr, inj: MILIRINONE 10/50 @ 4.0 ml/hr .child received treatment inj; Cefotaxime 500 mg iv tds, injAmikacin150 mg iv od, inj; pantocid 20 mg iv od, injTremadol 25 mg iv tds, injPerfalgan 250 mgiv qid, inj Lasix 20 mg bd, IVF-RL@ 30 ML/HR. I/O chart moniotoredWith favorable urine output. The patient regained clear consciousness after 12 hours, acceptable arterial blood pressure (90-100/50-60 mmHg) after 5 days of treatment than patient weaned off from ventilator 7<sup>th</sup> post of day. After 4 weeks patient discharged successfully.

### Nursing Management

*Decreased Cardiac Output* related to increased afterload, decreased myocardial contractility and reduced stroke volume, as evidenced by: decreased peripheral pulses, peripheral temperature, decreased systemic vascular resistance, pulmonary edema, increased pulmonary vascular resistance, Expected outcomes are:

- Patients showed reduced levels of dysponea experienced.

- Patients participating in participating in the activity and demonstrate increased tolerance.

#### *Nursing Interventions*

- Monitored vital signs such as: blood pressure, apical pulse and peripheral pulse.
- Monitored cardiac rhythm and frequency.
- Checked signs and symptoms of decreased output.
- Performed a comprehensive appraisal of peripheral circulation (e.g., check peripheral pulses, edemas, capillary refill, color, and extremity temperature).
- Rewarming the child with double blanket & warmer.
- Checked RA, pulmonary artery, pulmonary capillary wedge, systemic pressures.
- Monitored sensory and cognitive capacities especially level of consciousness.
- Observed cannulas for kinks or disconnection.
- Administered positive inotropic/contractility medications such as adrenaline, nor adrenaline, dopamine, dobutamine & milrinone according to physician order.
- Monitoring dysrhythmias, urine output, intake output hourly and then checked serum electrolytes especially sodium, potassium, calcium BE, HCO<sub>3</sub>, Lactate.
- Assessed the O<sub>2</sub> saturation.
- Assessed heart sounds for gallops.
- Monitored laboratory test such as CBC, NA<sup>+</sup>, K, CA urea and creatinine level.
- Positioned the patient in semi-Fowler's to high Fowler's position.

#### *Evaluation*

- Patient saturation was maintained.
- Pulse and BP maintained normal.
- Patient perfusion status was improved.

*Impaired Gas Exchange* related respiratory acidosis as evidenced by: decreased pO<sub>2</sub>, decreased SaO<sub>2</sub>, and increased pCO<sub>2</sub>.

#### **Expected Outcome**

To improve the spontaneous ventilation.

#### *Nursing Intervention*

- Noted chest movement, watching for symmetry, use of accessory muscles, and supraclavicular and intercostal muscle retractions.
- Monitored chest x-ray reports.
- Routinely monitored ventilator settings.
- Check all ventilator connections regularly.
- Monitored for adverse effects of mechanical ventilation: infection, barotrauma, reduced cardiac output.
- Monitored patient's respiratory secretions.
- Determined the need for suctioning by auscultating for crackles and bronchi over major airways.
- Monitored for respiratory muscle fatigue.
- Ensure that ventilator alarms are on nor off.
- Monitored for decrease in exhaled volume and increase in inspiratory pressure.
- Provided routine oral care.

#### *Evaluation*

Saturation was 98%, Po<sub>2</sub>- 112 mmhg (increased), Pco<sub>2</sub> -38 mmhg(reduced), ABG values shows normal.

*Ineffective Airway Clearance* related to thick sputum secondary to right lung pneumonia as evidenced by rapid respiration, diminished and adventitious breath sounds, and thick yellow sputum secretion.

#### *Expected Outcome*

To improve the airway pattern

#### *Nursing Intervention*

- Monitored rate, rhythm, depth and efforts of respiration.
- Auscultated breath sounds, noting areas of decreased or absent ventilation and presence of adventitious sounds.
- Auscultated lung sounds after treatment to note results.
- Monitored the client's ability to cough effectively.
- Encouraged the client to take several deep breaths.
- Encouraged the patient use of incentive spirometry, as appropriate.

- Monitored the client respiratory secretion.
- Provided nebulizer therapy as needed.
- Monitored for increased restless, anxiety, air hunger.
- Encouraged the client to take a deep breath, hold for 2 seconds and cough two or three times in succession.

*Evaluation* Saturation was 98% , every 4<sup>th</sup> hourly patient airway cleared by performing suctioning , respiratory secretion color, quantity was assessed , ABG values shows normal.

4. *Excess Fluid Volume* related right ventricular failure as evidenced by elevated CVP, bounding pulses, shortness of breath and dependent oedema.

*Expected outcome:* To reduce the excessive fluid overload.

#### *Nursing Intervention*

- Assess for signs and symptoms of excess fluid volume overload like a elevated CVP, bounding pulses, shortness of breath, dependent oedema, and distended neck and peripheral veins.
- Monitored vital signs and CVP.
- Assessed the presence and location of dependent oedema.
- Monitored fluid intake hourly.
- Checked the urine output hourly.
- Monitored intake and output chart at least every shift.
- Monitored infusion rate of parenteral fluids closely use infusion pump.
- Administered oral fluid with caution .don t give more oral fluid.
- Monitored laboratory values like NA, K, Ca, and arterial blood gas 3<sup>rd</sup> Hourly.
- Maintain semi to high fowler position.
- Administer diuretics as per physician order.

*Evaluation:* Patient Intake and output chart shoes negative balance, Pulse and BP normal , Decreased pedal oedema.

5. *Impaired Skin Integrity* related to dependent oedema & prolonged immobilization as evidenced by skin pelling, redness, damage of epidermis and dermis.

*Expected Outcome :* To improve the tissue perfusion.

#### *Nursing Intervention*

- Monitored site of impaired tissue integrity atleast 2 times daily for skin pelling, color, changes, redness, swelling, warmth, pain or other sin of infection.
- Patient turned every 2 hours as evidenced by nursing documentation.
- Applied air matters & airc ushion especially bony prominence area like sacrum.
- Air filled gloves kept under heels.
- Applied soft pad (Alwin pad) under bony prominence area like shoulder blade, sacrum and occipit.
- Kept some soft pad under ear cartilage & massage should be given with olive oil every 6-8 hours.
- Pt wound changed daily per wound care orders and proper hand hygiene will be performed before and after dressing changes.
- Advised the family members about leg exercise and olive oil massage.

#### *Evaluation*

Patient tissues perfusion function improved for example redness reduced, wound healed.

6. *Fear and Anxiety* related to prolonged ICU care.

*Expected Outcome:* To reduce anxiety level of the child.

#### *Nursing Intervention*

- Assessed the child behavior pattern during hospitalization.
- Encouraged to express felling and concerns about illness and hospitalization.
- Familiarize patient with the environment and new experience.
- Interacted with child in peaceful manner.
- Conversed using a simple language and brief statement.
- Avoided unnecessary reassurance this may increase undue worry.
- Encouraged child to write or ask the questions and to discuss with the health team members

*Evaluation:* Patient doubts clarified.

#### **Conclusion**

RHD is most common disease in female. RHD is results in valvular disease and heart failure, nurses

play important role in educating public on regarding in RHD early detection of disease. Post valve surgery patient care nurses play major role in prevention of surgery complication and good outcome of patient.

*Conflict of Interest*

Author don't have any conflict of interest

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