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Anaesthetic Management in a Patient with a Bio-Prosthetic Heart Valve Posted For Anterior Colporrhaphy

Dr Shefali Panjwani[1]
Dr Amartya Chaudhuri[2]
Dr Vinaya Kulkarni[3]
1,2: Resident Doctor, Department of Anaesthesiology and Critical Care, BJGMC, Sassoon Hospital, Pune, Maharashtra, India
3: Associate Professor, Department of Anaesthesiology and Critical Care, BJGMC, Sassoon Hospital, Pune, Maharashtra, India

Abstract
BACKGROUND: *Rheumatic Valvular Heart Disease (RVHD) is a systemic immune condition consequent to the beta-hemolytic streptococcal throat infection. It is an acquired heart disease. Single/ repeated attacks of rheumatic fever cause deformity of the heart valves, and over 20-30 years, may result in stenotic/ regurgitant valvular heart lesions. Prosthetic valve implants alleviate these patients. Patients with prosthetic valves project a specific challenge to the anesthesiologist due to the risk of thromboembolic events, bleeding and infective endocarditis.* ***CASE PRESENTATION:*** *A 56-years-old female, who had undergone Mitral valve replacement with a bio-core prosthetic valve five weeks ago, because of RVHD with severe Mitral Regurgitation (MR), was posted for 3rd-degree cystocele repair. The surgery was performed under combined epidural spinal anaesthesia.* ***CONCLUSION:*** *Regional anaesthesia provides intense analgesia, and hence plays an important role in the management of patients with heart disease undergoing surgery. These patients tend to tolerate regional anaesthesia well as long as adequate preloading is done and coronary artery perfusion is well maintained. We meticulously surveilled to avoid any increase in myocardial work and oxygen demand of the heart, and proper perioperative bridging therapy of anticoagulants was done.*

Keywords: *Rheumatic Valvular Heart disease, Regional Anaesthesia, Epidural Anaesthesia, Mitral valve Replacement, Bridging therapy of anticoagulants.*

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I. Background

Rheumatic fever occurs as a consequence of a β hemolytic streptococcal throat infection[1,2] RVHD is a systemic immune condition[1] that occurs as a complication of rheumatic fever. It is an acquired heart disease. It is a leading cause of valvular heart disease in developing countries[3]. Single/ repeated attacks of rheumatic fever cause rigidity of the heart valves, making them deformed[1]. It causes shortening and fusion of chordae tendineae, and over 20-30 years may result in valvular stenosis or regurgitation. The Mitral valve is the most commonly affected. This case reports successful anaesthetic management of 3rd-degree cystocele repair in an RVHD patient who has undergone Mitral valve replacement five weeks ago for severe MR.

II. Case Report

56-years-old female from India, weighing 62kg, ASA grade II, had chief complaints of urinary incontinence and dribbling of urine for the past seven years, associated with a small mass coming out of the vaginal orifice. She was posted for 3rd-degree cystocele repair by anterior colporrhaphy.

Her past history revealed a history of New York Heart Association (NYHA) grade 3 breathlessness (refer to table 1 for NYHA Grades of breathlessness), palpitations, and two episodes of syncope four months ago when she was diagnosed with RVHD. She was also diagnosed with hypertension and diabetes mellitus on the same evaluation. Before she got operated on for MR, her preoperative two-dimensional echocardiography (2D Echo) was suggestive of Myxomatous mitral valve, severe MR, mild Tricuspid Regurgitation (TR), and mild Pulmonary Arterial Hypertension (PAH) with Left Ventricular Ejection Fraction (LVEF) 55%, Right Ventricular Systolic Pressure (RVSP) 33. Mitral valve replacement (MVR) with a bioprosthetic valve (BIOCOR-27), was performed for her RVHD five weeks ago. The patient was electively ventilated for two days after MVR and had an ICU stay of 6 days. She began the following medications at the time of discharge: Tab

Amiloride (40 mg)+furosemide (5 mg) OD, Tab Enalapril maleate 2.5 mg OD, Tab Metoprolol succinate 25 mg OD, Tab Aspirin 75 mg OD, Tab Warfarin 5 mg HS, Tab Metformin 500 mg BD. She was operated on for abdominal hysterectomy ten years ago under GA for uterovaginal prolapse.

Presently she has NYHA grade II breathlessness (table 1). No complaints of chest pain, palpitations, cold, cough and fever. Post-MVR, her 2D Echo findings were: normally functioning mitral valve prosthesis, good LV systolic function, LVEF: 55%. On examination, she was afebrile, regular pulse rate of 112/min, blood pressure of 110/70 mm Hg, Metabolic Equivalent Testing Score (METS) 4-6 & Breath-holding time >45 seconds. On auscultation, S1 S2 were audible along with click. A sternotomy incision scar was present on the chest.

NYHA GRADE I	No limitations. Ordinary physical activity does not cause undue fatigue/dyspnea
NYHA GRADE II	Slight limitation of physical activity but comfortable at rest
NYHA GRADE III	Marked limitation of physical activity. Less than ordinary physical activity will lead to symptoms
NYHA GRADE IV	Symptoms of congestive heart failure present even at rest.

Table 1: NYHA grading

Her preoperative lab reports are given in table 2

Hemoglobin	13.2 gm%
Total Leukocyte count	14,000 /mm^3
Platelet count	2,95,000 /mm^3
Prothrombin Time (PT)	14.7 seconds
International Normalized Ratio (INR)	1.08
activated Partial Thromboplastin Time (aPTT) /ratio	29.2/ 0.97
Fasting Blood Sugar Level (BSL)	128 mg/dl
Random BSL	147 mg/dl

Table 2: Pre-operative lab reports of patient

Chest x-ray was suggestive of cardiomegaly, twelve-lead-electrocardiogram (ECG) implied Left ventricular hypertrophy with left axis deviation.

Plan of management: We planned to manage this case under combined epidural and spinal anaesthesia with adjuncts.

Preoperative preparation: On pre-anaesthetic evaluation, preexisting medical conditions were evaluated & optimized for anticipated surgery. The patient was advised to discontinue Tab. warfarin five days before the surgery, and she was started on intravenous Heparin 5000 IU (un-fractioned) twice daily.

All appropriate preoperative investigations were done, High-risk consent was taken. Oral hypoglycemic agents were withheld on the day of surgery. The last dose of intravenous heparin was administered 6 hours before surgery, and the coagulation profile on the day of surgery revealed PT 14.7 seconds (control-14 seconds), INR 1.08 (Control 1.1), aPTT 32 seconds (control-28 seconds). One unit of cross-matched packed human-red-blood-corpuscle, two units of Fresh Frozen Plasma and Inj Protamine were reserved, in case of undue blood loss during surgery. We administered intravenous Ampicillin 1.5 grams and Gentamicin 80 mg as prophylaxis of Infective Endocarditis 30 mins before skin incision. The plan of anaesthesia was explained to the patient with written informed consent.

Intraoperative: Multi-vital parameters were attached; maintenance fluid was started with an 18-gauge intravenous cannula. The defibrillator was checked and kept ready. The high-risk cardiac trolley was arranged with all emergency cardiac drugs. Combined spinal-epidural anaesthesia with adjunct was used. In sitting position, under aseptic conditions, 16-gauge Touhy's needle was inserted through L3-L4 intervertebral space, epidural access was confirmed by Loss of Resistance (LOR) technique, and the epidural catheter was inserted and fixed at 8 cm in-situ, test dose of 3 ml 2% Lignocaine with Adrenaline was given. Spinal anaesthesia was given with intrathecal injection of a solution of 2 ml 0.5% hyperbaric bupivacaine 2ml and 25 µg fentanyl (50 µg/cc), in sitting position, through L4-L5 intervertebral space, using 25G Quincke's needle. The neuraxial blockade level was T10. The patient had tachycardia with a heart rate of 110 beats/min, managed with anxiolysis by intravenous injection of 1mg midazolam. Blood pressure fell to 90/50 mm Hg, managed with intravenous phenylephrine 20 µg. Total 1-litre warm crystalloids (500 ml ringer lactate and 500 ml 0.9% Normal Saline) was administered. Oxygen saturation was maintained at 100%, with oxygen supplied at a flow rate of 4litres/min via Hudson mask for the entire duration of surgery (120 minutes). Blood Sugar Level at the end of the surgery was 146mg/dL. Urine output was 500ml, and Total blood loss: 80ml.

Immediate postoperative period: Intravenous Ondansetron for postoperative nausea & vomiting prophylaxis, & we gave 6 ml epidural analgesic dose of bupivacaine (0.125% w/v) with tramadol 50mg, after negative aspiration, for postoperative pain. The epidural catheter was removed thereafter and catheter integrity was confirmed.

Postoperative day 0: Patient was shifted to High Dependency Unit for monitoring. Second dose of Inj. Ampicillin 1.5 grams was administered in the postoperative period, 6 hours from the last dose. Vital parameters

were monitored, multimodal analgesia was administered with Inj. Paracetamol 1000 mg BD and Inj. Tramadol 100 mg BD. Hypothermia was prevented postoperatively using warm fluids and warm blankets. The patient had no complaints of chest pain, shortness of breath, pedal oedema in the postoperative period. 12 hours after the surgery, the drains did not show any undue bleeding and the next dose of Inj. Heparin 5000 IU was administered intravenously.

Postoperative day 1: The patient had no fresh complaints; she was shifted back to the ward. Her postoperative hemoglobin was 12mg/dL, total leukocyte count had decreased to 8,000/µl. She was also started on tab Warfarin 5mg HS. Her coagulation profile- Prothrombin Time, INR, aPTT were monitored daily.

Postoperative day 4: Her INR was 2.5. Inj. Heparin was stopped and tab. Warfarin 5 mg HS was continued as before. There were no fresh complaints by the patient. She was clinically stable. Her postoperative lab reports were within normal limits. Postoperative anticoagulants were started and required INR for a bio-prosthetic valve was achieved. Her postoperative 2D Echo was done which revealed a normal functioning prosthetic valve without clots/ vegetations.

III. Discussion

Patients with prosthetic heart valves are at significant risk of thromboembolic events perioperatively. Patients with new generation prosthetic heart valves should receive warfarin to achieve an INR of 2.5-3.5, and for older types of prosthetic heart valves, the target INR is 3.5-4.5 [4]. But due to the high risk of bleeding – INR should be within normal limits (<1.5) for the surgery. Hence proper bridging of the anticoagulant therapy plays a vital role in the management of these patients. It is a tricky situation for an anesthesiologist. On one hand, the continuation of anticoagulants may cause significant bleeding during the surgery, but on the other, discontinuation of anticoagulation in the perioperative period can lead to life-threatening thromboembolic events. The risk of thrombo-embolism on withholding warfarin, in the perioperative period, in patients with mechanical heart valve prosthesis, varies from 1% to 20% [5,6]. A thrombus itself can occlude the prosthetic valve in 1-13% of cases [7]. The European Society of Cardiology and the 4th American College of Chest Physicians Consensus Conference on anti-thrombotic therapy recommend perioperative heparinization. Perioperative heparinization is done, to minimize the risk of thrombosis resulting from INR returning to normal limits [8,9]. In patients with risk of thromboembolism, oral anticoagulation is switched to intravenous unfractionated heparin/ subcutaneous Low Molecular Weight Heparin (LMWH) at least five days before surgery. A dose of intravenous heparin is given 6 hours before the surgery, and it should be restarted preferably within 12 hours of surgery. (For this reason, the epidural catheter was removed in this case immediately after surgery period and intravenous multimodal analgesia was administered)

Tab. Warfarin is restarted within 24 hours postoperative period. Overlap of intravenous heparin and oral tab. warfarin is continued, till the INR is in the therapeutic range required for the bio-prosthetic valve. Once the required INR is achieved, intravenous heparin should be withheld, and only tab. warfarin is continued. If the surgery is an emergency, the action of warfarin should be neutralized by fresh frozen plasma, the dose is titrated till the INR achieved is <1.5. Regional anaesthesia, by virtue, provides intense analgesia. So, regional anaesthesia can be used instead of general anaesthesia, for the management of patients with heart diseases undergoing surgery, avoiding the complications associated with general anaesthesia. These patients tend to tolerate regional anaesthesia well, as long as adequate preloading is done and coronary artery perfusion is maintained. We meticulously surveilled to avoid any increase in myocardial work and oxygen demand of the heart, caused by tachycardia due to either pain, anxiety or hypotension. CAUTION: While administering Regional Anaesthesia to such patients, due to associated sympathectomy, there could be a sudden/ excessive decrease in peripheral vascular resistance, which will lead to a fall in preload and cardiac output, further leading to reduced myocardial perfusion. Watch for signs of acute left ventricular failure and arrhythmias, as these patients are at an increased risk for these cardiac events intra- and postoperatively. Special attention was paid towards peri-operative bridging therapy of anticoagulants and postoperative early restarting of anticoagulants, level of the neuraxial blockade, and appropriate monitoring intra- and post-operatively. The antibiotic prophylaxis regimens recommended by the American Heart Association are only for patients with underlying cardiac conditions associated with the highest risk of adverse outcome from infective endocarditis [10,11] (e.g., patients with prosthetic cardiac valve).

IV. Conclusion

This report underscores the importance of proper management and bridging of the anticoagulant therapy in patients with mechanical prosthetic heart valves, posted for major elective surgery. Proper anticoagulant therapy and infective endocarditis prophylaxis play vital roles to prevent various life-threatening complications like thrombosis, bleeding [12] and infective endocarditis. Management of patients with prosthetic heart valves, for non-cardiac surgery, involves assessing valvular function, infective endocarditis, residual

pathology, and functional status of heart; optimizing the cardiac status, formulating a proper anaesthetic plan, monitoring parameters perioperatively, recognizing complications early and managing such events.

LIST OF ABBREVIATIONS

RVHD- Rheumatic Valvular Heart Disease
MR- Mitral Regurgitation
GA- General Anaesthesia
ASA- American Society of Anesthesiology
NYHA- New York Heart Association
PAH- Pulmonary Arterial Hypertension
LVEF- Left Ventricular Ejection Fraction
RVSP- Right ventricular Systolic pressure
HS- Hora Somni (at bedtime)
OD- Once daily
METS- Metabolic Equivalent Testing Score
FBSL- Fasting blood sugar level
RBSL- Random blood sugar level
PT- Prothrombin Time
INR- International normalized ratio
aPTT- activated Partial Thromboplastin Time
AHA- American Heart Association
LMWH- Low Molecular Weight Heparin

DECLARATIONS

Competing interest: The Authors declare that they have no competing interests.

Author's contribution: All the authors were involved in the management of the case and finalizing the article. All the authors were involved in the process of editing, correcting and finalizing the manuscript. All the authors have read and approved the final manuscript.

Consent: The patient and the patient's relatives are pleased to give written consent for publishing this case report.

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