

Triple Valve Surgery in a Patient with Rheumatoid Arthritis*

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ABSTRACT

Rheumatoid arthritis is a multisystem disorder that affects not only the musculoskeletal system but also other vital organ systems. This report tackles a case of a Filipino adult female with a 28-year history of rheumatoid arthritis on chronic DMARD and steroid use who developed symptoms of heart failure. This report will review the perioperative implications of a patient with rheumatoid arthritis for triple valve surgery.

Keywords

Triple Valve Surgery, Rheumatoid Arthritis

INTRODUCTION

Rheumatoid arthritis (RA) is a multi-system autoimmune disease characterized initially as an erosive, symmetrical polyarthropathy which may also affect the function of other organs in the body.¹ The prevalence of RA in industrialized countries is 0.5-1%.⁷ In a state of chronic systemic inflammation, patients with rheumatoid arthritis are predisposed to the development of heart disease including accelerated atherosclerotic disease and valvular lesions.⁷ Compared with persons without RA, those with RA have twice the risk of developing heart failure not explained by traditional cardiovascular risk factors and ischemic heart disease.²

We present a case of a Filipino adult female with RA who presented with symptoms of heart failure and was assessed with severe mitral and aortic regurgitation and moderate tricuspid regurgitation who underwent aortic and mitral valve replacement with tricuspid valve annuloplasty.

In RA patients undergoing surgery, multiple perioperative concerns are taken into consideration when planning for anesthetic management.

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OBJECTIVES

In presenting this case, we aim to discuss the preoperative preparation, intraoperative and postoperative management of an RA patient with multivalvular heart disease.

CASE DESCRIPTION

Background

The patient is a 47-year old female known to have rheumatoid arthritis since 1995, initially presenting as hand and joint pains. She has been on treatment since then, and has regular consults with her rheumatologist. She was maintained on Prednisone, Methotrexate, Paracetamol and Celecoxib as needed for pain. She underwent bilateral hip and knee arthroplasty due to avascular necrosis and knee contractures. Atorvastatin was being given for atherosclerotic heart disease, coronary artery disease, while Losartan was given for hypertension.

Two months prior to admission, the patient experienced progressive bipedal edema, with exertional dyspnea, three pillow orthopnea, and decreased appetite.

One month prior to admission, she was diagnosed with cellulitis on the right thigh, with progression of bipedal edema. Further workup was done which led to the diagnosis of heart failure with preserved ejection fraction, severe mitral and aortic regurgitation. The patient was admitted for treatment of cellulitis and during the same admission, was advised to undergo valvular repair or replacement.

On admission, examination revealed moon facies, limited extension, flexion and rotation of the neck, mouth opening measuring less than 3 fingerbreadths, Boutonniere deformity of the second to fifth digits of the hands, inability to extend wrists, limited lower extremity movement with muscle atrophy.



She weighed 48 kg with a BMI of 18. A circumscribed erythematous lesion over the right medial thigh was seen.

Preoperative Tests

CBC was normal. Serum sodium was 134 and potassium was 3.15. ESR was 14. Prothrombin Time was 14.3, INR was 1.2, and aPTT was 34.8.

2D Echo showed an ejection fraction of 56%, mitral valve prolapse, anterior mitral valve leaflets with severe mitral regurgitation, concentric left ventricular hypertrophy with adequate wall motion and contractility and preserved systolic function with Gr. 3 diastolic dysfunction, normal resting ventricular systolic function, biatrial dilatation with no evidence of thrombus, aortic sclerosis with moderate to severe aortic regurgitation, dilated mitral annulus with severe mitral regurgitation, moderate tricuspid regurgitation, mild pulmonic regurgitation, high probability of pulmonary artery hypertension.

12 lead ECG showed sinus rhythm, left axis deviation, left ventricular hypertrophy with strain or ischemia, and lateral wall ischemia.

Coronary angiogram revealed normal coronary arteries.

Preoperative Preparation

Prior to the day of surgery, the patient's condition was optimized to decrease the risk of morbidity and mortality perioperatively. Multidisciplinary juntas were conducted. Cellulitis on the right thigh caused by MRSA was treated with Clindamycin prior to surgery. The patient underwent dental extraction and clearance due to multiple infected teeth. Electrolyte imbalances were corrected accordingly. The patient was started on Enoxaparin while Prednisone, Atorvastatin and Losartan were continued. She was assessed then to have RA with low disease activity.

The patient was eventually given the following risk stratification: high risk for perioperative cardiovascular events, low risk from dental standpoint, no objection from Infectious Diseases and Rheumatology. For anesthesia, the patient was identified to have a difficult airway and invasive line insertion is expected to be difficult due to her deformities.

Preoperatively, the patient was kept on NPO for 8 hours prior to surgery. Enoxaparin and losartan were discontinued 24 hours prior. Omeprazole 40mg tablet was given prior to NPO status. Two units pRBC, 2u FFP, 4u PC, and 4u cryoprecipitate were reserved for intraoperative use. The anesthesia plan was combined general endotracheal anesthesia with intravenous anesthesia.

Intraoperative Course

Pre-Induction:

The patient was wheeled in with oxygen support and was hooked to standard ASA monitors. Cerebral oximetry and BIS monitors were placed prior to invasive line insertion. After adequate sedation with Midazolam, Nalbuphine and Fentanyl, invasive lines and monitors were inserted with ultrasound guidance. Large bore IV catheters were not placed on the extremities due to thin, fragile

skin and vasculitis. Due to hand deformities, the radial arteries were inaccessible for arterial line placement. The arterial line was placed at the right femoral artery. A central line was placed on the right femoral vein while a right IJ vein catheter with pulmonary artery catheter was inserted for pulmonary artery pressure monitoring. Patient had moderate PAP with initial mean reading of 36 mmHg. During placement of these lines, vital signs were maintained as follows: BP was 120-130/45-55, HR was 75-80, and RR 16-20. Dexamethasone 10mg/IV was given to prevent post-operative nausea and vomiting.

Induction:

Midazolam 4 mg/IV, Nalbuphine 8 mg/IV, Tranexamic acid 1 g/IV, and Fentanyl 400mcg/IV were given for induction of anesthesia. Induction medications were titrated carefully with guidance of BIS monitor to achieve adequate level of anesthesia while avoiding severe bradycardia and hypotension. Endotracheal intubation using a 7.0mm cuffed tube was performed smoothly under videolaryngoscopy using D-blade on first attempt while avoiding external manipulation of the neck.

Intraoperative Course:

A combination of Sevoflurane and Propofol infusion were used as maintenance while an infusion of Rocuronium was used. Tranexamic Acid infusion was also started prior cutting. TEE assessment was done prior to heparinization and initiation of CPB, which was uneventful. Aortic valve replacement, mitral valve replacement, tricuspid valve annuloplasty, and closure of patent foramen ovale were done. Total bypass time was 3 hours and 48 minutes, and aortic cross clamp time was 3 hours and 24 minutes.

Post valve replacement intraoperative TEE showed an EF of 55%, hypokinetic septum, base to apex, MV and AV were noted to have good opening and closing and without paravalvular leak.

Weaning off bypass was smooth and was unremarkable with titration of Dobutamine, Milrinone, and Norepinephrine. Heparin reversal was done with protamine and transfusion of the following were given: 1 packed RBC, 4 units of cryoprecipitate, and 4 units of platelet concentrate. After the surgery, the patient was given a bilateral parasternal and serratus anterior plane block with Bupivacaine 0.125% 20 mL per site of injection for pain management.

Postoperative Course:

Postoperatively, the patient was monitored at the ICU and was successfully extubated on day 1 post op. Her postoperative course was complicated by HAP which was successfully treated with antibiotics. Three weeks after the surgery, patient was eventually discharged stable.

DISCUSSION

Rheumatoid arthritis is a chronic, autoimmune, and inflammatory disease characterized by symmetric polyarthropathy and diverse systemic effects³ affecting approximately one percent of the population.⁴ Several factors should be considered to ensure safe and effective perioperative management.

Comprehensive preoperative assessment is crucial in patients with RA. It should include documentation of symptoms related to organ systems involved with detailed examination of the neurologic, airway, pulmonary and cardiovascular systems. Baseline level of function, disease severity and associated complications should be determined. A review of medications is done to determine possible interactions with anesthetic drugs. It may be necessary to withhold drugs prior to surgery including immunosuppressants like biologic DMARDs and TNF inhibitors, B cell inhibitors, and IL-6 inhibitors which predispose patients to infections.⁵ All possible sources of infection were controlled including dental infection. Psychological

preparation was done by explaining in detail what to anticipate intraoperatively and postoperatively, including invasive monitors, planned extubation, risks and possible complications. Questions were encouraged to promote understanding of the procedure.

Several potential complications may be seen in RA. Cardiovascular involvement may present with atherosclerotic disease, coronary artery disease and myocardial infarction, pericarditis, and valvular heart disease.⁶ If indicated, coronary angiography may be done in addition to ECG and echocardiography such as in the case presented.

Pulmonary manifestations include restrictive disorders and pulmonary fibrosis which can reduce forced vital capacity and forced expiratory volume. With progressive lung injury, hypoxemia and reduction in gas exchange can be seen.⁶ In this patient, incentive spirometry was started preoperatively to prevent postoperative pulmonary complications.

In the absence of nephrotoxic medications, more than 40% of RA patients have renal dysfunction. Significant renal disease is more common in those undergoing therapy with nephrotoxic effects.⁶ Determination of renal function allows for adjustment of anesthetic medication doses. The patient had a normal level of creatinine and eGFR.

RA may involve the temporomandibular joints and cricoarytenoid cartilage leading to limited mouth opening and hoarseness. Spine involvement can lead to cervical instability.¹ RA affects the atlanto-axial joint due to attenuation of the transverse ligament and erosion of the odontoid peg hence patients may present with a difficult airway.⁸ When acute subluxation occurs due to improper handling of the patient, spinal

cord and vertebral artery compression may occur leading to quadriparesis or death. Induction of anesthesia must be properly planned, with preparation of materials for difficult airway intubation. During induction of anesthesia in this patient who had inadequate thyromental distance and mandibular length, Mallampati score of 3, and limited neck mobility, careful intubation with a videolaryngoscope was done with the head in the neutral position, with a fiberoptic endoscope on standby. Common positioning techniques for intubation such as the sniffing position were not done.

Positioning of the patient during surgery should be done carefully to prevent joint and nerve injury. Pressure points were padded.

Cardiopulmonary bypass can cause an acute inflammatory response leading to significant morbidity and mortality due to contact activation of blood by surgical wounds, and synthetic perfusion circuits.⁹ In a state of chronic inflammation, a short bypass time is required to prevent the development of SIRS.

The goals of anesthesia are to maintain contractility, reduce afterload, maintain normal volume, and reduce pulmonary artery pressures because severe MR and AR with moderate TR patients cannot tolerate bradycardia, high afterload, reduced preload and increased pulmonary pressures.

Postoperatively, observation of the airway and breathing are required after extubation due to possible airway obstruction from unrecognized glottic stenosis. Adequate pain control prevents delayed mobilization, thromboembolism, and infections.¹ In this case, a peripheral nerve block was done to reduce the need for multiple systemic pain medications.

Considering all these, tailoring the anesthetic perioperative plan to the patient's needs, disease severity and complications is crucial for achieving favorable surgical outcomes.

CONCLUSION

Rheumatoid arthritis puts the patient at higher risk for morbidity and complications perioperatively. Anesthesiologists must aim for patient optimization achieved with multidisciplinary teamwork before surgery in RA patients, whose primary disease has multi organ effects. Due to multiple musculoskeletal deformities, the anesthesiologist must be careful to prevent further insult in a patient undergoing major surgery, especially during anesthesia induction, airway management, introduction of invasive lines. All medications must also be reviewed to determine whether they may be continued intraoperatively and whether these medications may have interactions with anesthesia management.

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