Anesthetic Considerations for Cervical Fusion Surgery in Advanced Rheumatoid Arthritis and Severe Pulmonary Hypertension

Robert Canelli MD (1), John Weaver MD (2), Elifce Cosar MD (1)
(1) Department of Anesthesiology, UMassMemorial Medical Center, Worcester, MA
(2) Department of Neurosurgery, UMassMemorial Medical Center, Worcester, MA

Abstract

67 year-old female with a history of rheumatoid arthritis (RA) and pulmonary hypertension (PH) presented for urgent C4-C5 anterior diskectomy and C3-C6 posterior fusion for cervical subluxation. C-spine MRI showed severe cord impingement. The patient was brought to the operating room with minimal sedation to avoid exacerbation of PH. The radial artery was inaccessible due to flexion deformities, thus a brachial arterial line was placed. Awake fiberoptic intubation was performed with dexmedetomidine, followed by demonstration of movement of all four extremities. The anesthesia was maintained with dexmedetomidine and desflurane. The anterior and posterior portions of the procedure were performed uneventfully with no change in baseline somatosensory evoked potentials (SSEP) and motor evoked potentials (MEP). The patient was extubated at the end of the case and was followed in the intensive care unit (ICU) and was discharged to rehabilitation in good condition.

Background

Past Medical History:
Severe PH, advanced RA and scleroderma, chronic steroid therapy, chronic renal insufficiency (CRI), pseudocholinesterase deficiency
Past Surgical History:
Hysterectomy, partial colectomy, multiple lysis of adhesions, wrist surgery
Medications:
Ambrisentan, sildenafil, leflunomide, diclofenac, methylprednisolone, furosemide, pantoprazole, home oxygen
Allergies:
Succinylcholine, morphine
Imaging:
TTE: EF 65%, septal systolic and diastolic flattening, systolic pulmonary artery pressures 70 mmHg, right ventricle (RV) dilated with reduced systolic function, right atrium (RA) dilated, mild MR, moderate TR
MRI C-spine: diffuse cervical spondylosis with anterolisthesis of C4 on C5, severe central canal stenosis, cord impingement and myelomalacia.

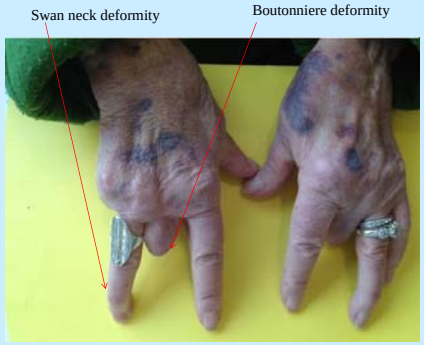
Rheumatoid Arthritis

The atlanto-axial joint is commonly affected in RA, causing atlanto-axial subluxation. Subaxial subluxation which occurs below C2 leads to earlier symptoms of nerve compression. Temporomandibular joint (TMJ) invovement may cause limitation of mouth opening and render direct laryngoscopy impossible. Fiberoptic intubation has improved the safety of airway management in surgical patients with RA. Where intubation is anticipated to be difficult because of cervical instability or a reduction in neck movement, an awake fiberoptic intubation and positioning of the C - spine is highly recommended [1].

Long term steroid therapy causes adrenal suppression, vasculitis, thin and fragile skin, which can render intravenous (IV) access difficult. The radial artery may be inaccessible because of flexion deformities of the wrist joint. Central venous catheters may be difficult to insert because of limited neck movement [1].

Imaging

Preoperative MRI demonstrating anterolisthesis of C4 on C5 causing moderately severe central canal stenosis and cervical spinal cord impingement



Classic physical findings of RA in hands including ulnar deviation, boutonniere deformity, and swan neck deformity

Post-operative MRI revealing surgical changes, improved anatomical alignment, improved canal dimensions at C4-C5

Post-operative c-spine x-ray demonstrating extensive anterior and posterior surgical hardware

Pulmonary Hypertension

PH is a life-threatening disease with a complex pathophysiology. The most recent classification was established in 2008[2]. The 5 main categories are: (1) pulmonary arterial hypertension, (2) pulmonary venous hypertension due to left heart disease, (3) PH associated with lung disease, (4) chronic thromboembolic PH, and (5) PH with unclear multifactorial mechanisms. All pathways eventually lead to an altered vascular endothelium and smooth muscle function through cellular remodeling[3]. Therapy is focused on improving hemodynamics, quality of life, and survival. The most important predictor of survival in PH is RV function.

Discussion

Patients with PH have markedly increased morbidity and mortality in the perioperative period[4]. Preoperatively, thorough evaluation and risk assessment are necessary. Any chronic medical treatment should be continued until surgery [5].

The intraoperative goal is to maintain adequate preload, systemic vascular resistance and contractility in order to allow the RV to maintain cardiac output. Acute on chronic increases in pulmonary vascular resistance (PVR) during the perioperative period can be caused by hypoxia, hypercarbia, acidosis, hypothermia, pain and anxiety. Early recognition and reversal of these causes could be life saving [5].
This increase in RV afterload translates to increased RV transmural pressures leading to lack of perfusion of the RV myocardium throughout systole and diastole and ultimately acute decompensation[5]. In contrast, hypotension and decreased preload should be aggressively treated to avoid decreased RV coronary perfusion and loss of the contribution of the interventricular septum to RV ejection[5].

Intraoperative treatment modalities for acute RV failure include IV vasodilators which may worsen hypotension, milrinone which can improve contractility, inhaled nitric oxide, inhaled or IV prostacyclin[6]. Given its favorable sedative and anxiolytic properties together with its limited effects on pulmonary and respiratory function, there is growing evidence that dexmedetomidine can be used in PH patients [7].

References

1. Fombon et al. Anaesthesia for the adult patient with rheumatoid arthritis. Continuing Education in Anaesthesia, Critcal Care & Pain 2006; 6: 235-239.
2. Simonneau G, *et al*. Updated clinical classification of pulmonary hypertension. J Am Coll Cardiol 2009;54:43-54.
3. Tuder RM, *et al*. The pathobiology of pulmonary hypertension: endothelium. Clin Chest Med 2001;22:405-418.
4. Hill NS, *et al*. Postoperative pulmonary hypertension: etiology and treatment of a dangerous complication. Respir Care 2009;54:958-968.
5. Pritts CD, *et al*. Anesthesia for patients with pulmonary hypertension. Curr Opin Anaesthesiol 2010;23:411-416.
6. Fox C, *et al*. Perioperative management including new pharmacological vistas for patients with pulmonary hypertension for noncardiac surgery. Curr Opin Anaesthesiol 2008;21:467-472
7. Tobias et al. Dexmedetomidine: Applications for the pediatric patient with congenital heart disease. Pediatr Cardiol 2011;32:1075-1087.