Case Report

Indian Journal of Anesthesia and Analgesia
Volume 9 Number 1 January-Febuary 2022
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.9122.7

Acromegalic Cardiomyopathy: A Pandora of Hidden Comorbidities

Sakshi Kadian[1], Sonia Dorathy N[2], Sharmistha Pathak[3], Swathi M[4], Sanjay Agrawal[5]

Author's Affiliation:

[1,3,4]Senior Resident, [2]Junior Resident, [5]Professor and Head of Department, Department of Anesthesiology and Critical Care, All India Institute of Medical Sciences, Rishikesh, Uttarakhand 249203, India

Abstract

Acromegaly, a neuroendocrine disorder due to excess growth hormone and insulin like growth factor-1, has large spectrum of underlying comorbidities. Hereby we report acromegalic cardiomyopathy in 65 year old male patient who also had acromegalic changes involving various other systems and anesthetic management of the same when he was scheduled for definitive transnasal trans-sphenoidal resection of pituitary adenoma.

Keywords: Acromegaly; Cardiomyopathy; Pituitary adenoma; Trans-sphenoidal resection.

Introduction

Acromegaly is a rare disease with an incidence of 0.2-1.1 cases per million per year.[1] It is a neuroendocrine disorder characterised by Growth hormone (GH)and Insulin-like growth factor 1 (IGF-1) excess and is usually associated with pituitary adenoma.[2] Systemic complications include hypertension, glucose intolerance, ischemic heart disease, respiratory problems and malignancies.[3] Increase in the hormone level have an effect on cardiovascular system making cardiac impairment as one of the most common morbidity in acromegaly.[4]

Cardiac comorbidities also accounts for nearly 60% as cause of mortality in such a group in patients.[5] Left ventricular hypertrophy (LVH), dilated atria and ventricles, and LV diastolic and systolic dysfunction (LVDD and LVSD, respectively) are the common cardiac changes observed in acromegaly patients. Cardiac magnetic resonance (CMR) is considered the "gold standard" modality for diagnosis of cardiac functions in view of higher spatial resolution to assess myocardial mass, heart chamber volume, and ventricular systolic function.[6] Thus it also helps in prediction of the prognosis.[7] The anesthetic management of acromegaly is challenging owing to the involvement of the upper airway, the metabolic status and the cardiovascular complications anticipated.[8]

We present here the anaesthetic management of 65 year old acromegalic patient with severe systolic dysfunction and reduced Ejection fraction who presented for transnasal transsphenoidal resection of pituitary adenoma.

Case report

A 65 year old male, weighing 89 kg, height 177cm (BMI 28.4), presented to the neurosurgery

How to cite this article:

Sakshi Kadian, Sonia Dorathy N, Sharmistha Pathak, Swathi M, Sanjay Agrawal/Acromegalic Cardiomyopathy: A Pandora of Hidden Comorbidities/Indian J Anesth Analg. 2022; 9(1): 45-49.

Corresponding Author: Sanjay Agrawal, Professor and Head of Department, Department of Anesthesiology and Critical Care, All India Institute of Medical Sciences, Rishikesh, Uttarakhand 249203, India.

Email: sanjay.anaes@aiimsrishikesh.edu.in, **Received on:** 18.11.2021, **Accepted on:** 30.11.2021

outpatient department with history of low backache for 6 months. On examination he gave history of increase in size of hand and feet for past 8-10 years.

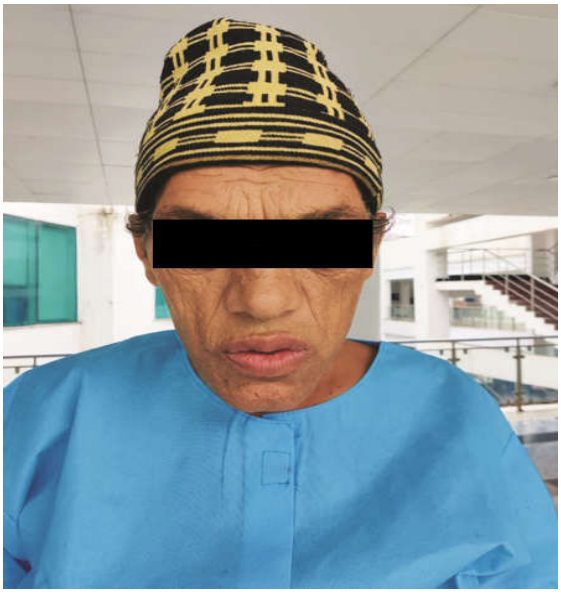

Fig. 1,2: shows acral enlargement of hands and feet and acromegalic facies.

He noticed tightening of ring in his finger and need for shoe size of 12. His family members gave history of change in voice, coarsening of facial feature and snoring. He was diagnosed with type 2 diabetes mellitus 6 months back for which he was taking tablet metformin 500mg twice daily .He is chronic smoker, smoking 45 pack years. He gave history of being operated for right Percutaneous Nephrolithotomy (PCNL) last year under spinal anaesthesia, which was uneventful.

On examination his hands were spade like and there was enlargement of jaws, lips and nasal cavity. The tongue was large and thick and airway was Mallampatti class III with an enlarged uvula and epiglottis and thyromental distance (thyroid notch to the tip of the jaw with the head extended) >6 cm(predictors for difficult intubation). He also had prominent supraorbital ridges, prognathism, coarse facial features, bulbous nose, increased incisor space, thick palm and soles. voice was hoarse and there was no history of visual disturbance His Blood pressure was 110/70mm Hg, pulse rate of 84/min. He had bilateral pedal edema but no pallor/cyanosis/clubbing/lymphadenopathy.

He was admitted for further workup and evaluation. Glycemic control was very poor with a glycosylated hemoglobin of 19.3% and random blood glucose of 430 mg/dl.12 lead ECG showed left bundle branch block(LBBB) following which 2D ECHO(echocardiography) was done. The findings were as follows: Ejection Fraction 30%, Global Left Ventricular (LV) dysfunction, Severe LV Systolic Dysfunction, LV dyssynchrony, Dilated Cardiomyopathy, No Vegetations/clot. Cardiac magnetic resonance is the gold standard but couldnot be done due to non availability at our institute. On cardiologist consultation, he was put on tablet carvedilol 3.125mg bd and tablet ramipril 1.25mg od.

Hormonal evaluation revealed

- Growth hormone level was >40 ng/ml by chemiluminescence (biological reference range in males: 0.003-0.97 ng/ml)
- Indian Growth Fund-1: 430 ng/ml (40.2 to 225 ng/ml is the value for his age).
- Serum cortisol- 20 ug/dl for 8 am sample (5-23 ug/dl)
- Serum prolactin- 154.77 ng/ml (2.1 – 17.7 ng/ml in males)
- Serum testosterone- 15.2 ng/dl (241- 827 ng/dl in males)
- Free T4- 1.2 ng/dl (0.93-1.7 ng/dl) {thyroid profile was within normal limits}.
- Serum Intact PTH: 91.7 pg/ml (11.1 – 79.5 pg/ml).

- Serum Vitamin D: 8.9 ng/ml (30-50 ng/ml)
- Serum LH was 0.66mIU/ml(1.5-9.3mIU/ml)

Serum electrolytes, renal and liver function tests, lipid profile were normal. On STOP BANG questionnaire for obstructive sleep apnea, he had a score of 4/8.Polysomnography was done which revealed AHI(Apnea hypoapnea index) 29.8/hour, his sleep efficiency was 69.3%, total periodic leg movement(PLM) index was 11.6/h and diagnosis of obstructive sleep apnea was confirmed.

Ophthalmology consultation revealed visual acuity of 6/18 bilaterally and normal visual fields. Dual-energy X-ray Absorptiometry (DXA) bone densitometry was done and Young adult T-score was 0.0 for L1-L4 spine and 0.5 for femur.

Contrast enhanced MRI (Magnetic resonance imaging) of brain showed well defined solid round to oval lesion measuring 22x25x21 mm in sellar region causing widening of sella (Figure 3). It was iso to hyperintense on T1/ Fluid Attenuated Inversion Recovery (FLAIR). On Diffusion-Weighted Imaging (DWI), patchy areas of mild restriction were seen with low values on Analog-to-Digital Converter (ADC) MAPS. ON Susceptibility Weighted Imaging (SWI) few foci of blooming were seen. Laterally, lesion was extending into left cavernous sinus and medial to intercarotid line of left Internal carotid artery (KNOSP grade II). Optic chiasma appeared normal. NCCT (non contrast computed tomography) Paranasal sinus revealed mucosal thickening in left frontal, maxillary and ethmoidal air cells.

Fig. 3: shows saggital image of the T1 MRI of the pituitary mass(arrow).

The final diagnosis made in this patient was: Acromegaly due to growth hormone secreting pituitary macroadenoma leading to dilated cardiomyopathy (DCM) with secondary hypogonadism with hyperprolactinemia with uncontrolled Type 2 DM(diabetes mellitus) with vitamin D deficiency with secondary hyperparathyroidism. Endocrinology consultation was taken and he was started on injection human regular insulin 12 units with meals and injection lantus 10 units HS. After 15 days of therapy his blood sugars were in the range of 150-200g/dl. After optimization, he was posted electively for Trans Nasal Trans Sphenoidal excision of pituitary macroadenoma under General Anaesthesia. A detailed pre-anaesthesia check-up was carried out and patient was taken under high risk consent in view of uncontrolled DM, poor cardiac status and anticipated difficult airway. Patient was asked to omit the morning dose of Insulin and he was asked to continue beta blockers and enalaprilon the morning of surgery.

After confirming the fasting status, patient was shifted on the operation table. Routine monitors including non invasive blood pressure, electrocardiogram, pulse oximeters, temperature probe were attached. 18G iv cannulation was done in dorsum of left hand. patient was preoxygenated with 100% oxygen for 3 minutes and Anaesthesia induction was achieved with fentanyl 150 microgram i.v(intravenous), injection etomidate 12mg i.v in incremental doses and after confirming mask ventilation, he was intubated after administration of injection vecuronium 10mg i.v. Two handed Bag mask ventilation was needed as it was difficult ventilation, owing to the protruding mandible and large tongue, however on Laryngoscopy Cormack-Lehane grade was 1. Airway was secured with 8.5 sized cuffed endotracheal tube and a throat pack was placed to prevent micro aspiration of blood from the surgical site into the airway.

There was no hypertensive response to orotracheal intubation. After securing the airway, invasive blood pressure monitoring via arterial cannulation was attempted in lower limbs but the distal pulse in lower limbs were feeble and as Allens test was positive, upper limb was ruled out(We planned to insert arterial cannulation pre-induction but as the distal pluses were very feeble, we planned to insert femoral arterial cannulation postinduction). After cleaning and draping of right femoral region, right femoral artery cannulation was done.

Right subclavian venous cannulation was also done to assess the central venous pressure. A trans esophageal echocardiography can give real time monitoring of cardiac function, but as this was a trans nasal surgery, with a throat pack in situ we couldnot do it due to resource constraints. Intraoperatively, anesthesia maintainence was done with oxygen and medical air in the ratio

of 50:50 in combination with sevoflurane with end tidal concentration of 1.5-1.6. Deep plane of anaesthesia was maintained with adequate neuromuscular blockade. 30 mins after induction, patient developed hypotension (84/60 mm hg) and so injection noradrenaline infusion was started and titrated accordingly to maintain MAP(mean arterial pressure) >65 mm hg. Also he was started on injection (HIR) regular insulin at 2 units/ hour and titrated to maintain normoglycemia according to hourly blood sugar monitoring. Arterial Blood Gases (ABG) was repeated every 2 hours to watch for hypoxia, hypercarbia and electrolyte imbalance and to monitor haemoglobin levels. Intraoperatively there was around 1000ml of blood loss for which 2 units of PRBC were transfused.

Care was taken to avoid fluid overload .Since cortisol levels were normal, there was no need for intraoperative steroid supplementation. After 8 h of surgery, patient was successfully extubated after reversing neuromuscular blockade. There was negligible cerebrospinal fluid (CSF) leak after tumour resection; hence, a lumbar intrathecal catheter to drain CSF was not considered. We observed him in surgical intensive care unit for 24 hours. Post-operatively the 12 lead ECG (electrocardiogram) had no fresh ECG changes.

He was shifted on injection noradrenaline infusion at 0.08mg/hr Postoperatively which he required for 2 days, during which his carvedilol and ramipril were nor restarted. After 2 days, his vitals stabilised off vasopressor support and cardiac drugs were resumed. Blood glucose was monitored 4th hourly and sliding scale was followed accordingly. In the postoperative period there was no indication of diabetes insipidus. Patient was discharged in satisfactory condition and advised strict follow up.

Discussion

Acromegaly, where elevated GH causes increased serum IGF-1 by stimulating IGF-1 synthesis at the liver and pancreas. The representative clinical findings are acral and soft tissue overgrowth, joint pain, diabetes mellitus, hypertension, and heart and respiratory failure. There are many challenges in the anesthetic management of a patient with acromegaly. Difficult airway is anticipated due to mandibular hypertrophy, macroglossia and large epiglottis.

These lead to limited visualisation of vocal cords during direct laryngoscopy and difficult bag and mask ventilation. They may also have glottis or subglottic stenosis, enlarged turbinates, vocal cord thickening and involvement of the recurrent laryngeal nerve.[9] Preoperative Mallampati III or IV identified as one of the predictive factors for difficult intubation.[10] Our patient had a large and thick tongue. His airway was Mallampatti class III with an enlarged uvula and epiglottis and thyromental distance >6 cm. Acromegaly is associated with various systemic complications and cardiovascular involvement is among the most severe , contributing to significant mortality rate among these patients. Acromegalic cardiomyopathy is the generic term which is used to denote cardiac complications in association with acromegaly. On a clinical level, these changes manifest as 3 main stages of acromegalic cardiomyopathy.[11] The first stage is characterized as a hyperkinetic syndrome, in which a hyperkinetic LV causes an increase in both contractility and cardiac output, with a lower peripheral vascular resistance.

IGF-1 increases calcium ion influx and concentration in the cardiac myocytes and also increases the sensitivity of contractile myocardial structures that can result in the hyperkinetic syndrome. Biventricular concentric hypertrophy, primarily affecting the LV, is present in more than two thirds of patients in this phase. The diastolic filling pattern is normal at this stage of disease. In the second stage, myocardial hypertrophy progresses, interstitial fibrosis develops, and diastolic function begins to deteriorate. This inadequate filling capacity, highlighted by the decrease in the diastolic filling wave, with early to late mitral and tricuspid velocity ratio and an elongation of the isovolumic relaxation time, is one of the most striking cardiac structural changes that occur in acromegalic cardiomyopathy.

Acromegalic cardiomyopathy is most commonly diagnosed in the second stage, when diastolic dysfunction decreases the patient's exercise capacity. The third stage of acromegalic cardiomyopathy is characterized by disruption of both diastolic and systolic function, which ultimately culminates in overt clinical congestive heart failure (CHF).[12] Presence of DCM (dilated cardiomyopathy) worsens the prognosis. Our patient was in third stage of cardiomyopathy as he also had the systolic component involvement(DCM with Ejection Fraction-30%, Global LV dysfunction, Severe LV Systolic Dysfunction, LV desynchrony). Thus acromegaly patients should be very keenly monitored for the cardiac function as long term hormonal derangements are almost always associated with cardiac abnormalities, although symptoms may not always be present as in this patient.

The intra-operative management of a patient with DCM has been described extensively in literature.[13,14] Measures taken to avoid precipitating heart failure include.

- Avoiding Myocardial depression (Propofol is best avoided)
- Maintaining Euvolemic status
- Avoiding fluctuations in BP and heart rate
- Maintaining good depth of anesthesia, analgesia
- Making use of lignocaine/beta blockers/ dexmedetomidine during induction and extubation to avoid tachycardia.
- Maintaining adequate preload and avoiding increase in afterload
- Optimizing blood electrolytes
- Using inotropic support when there are signs of myocardial depression.

An Intraoperative trans esophageal echocardiography can give a lot of information about the myocardial function during anesthesia.

Our patient was managed as follows:

- Anesthesia was induced with IV 16 mg Etomidate, 150 ug of Fentanyl, 60 mg of IV lidocaine hydrochloride and 8 mg of vecuronium bromide.
- Airway was secured and a throat pack was placed to prevent micro aspiration of blood into the airway.
- Central venous access was secured through the right subclavian vein.
- Arterial line was secured in the right femoral artery.
- Hypotension was managed with noradrenaline infusion maintain MAP > 65 mm hg.
- Trans-esophageal echocardiography was deferred in view of the throat pack in situ.

Conclusion

Acromegalic patients, especially those having multiple endocrine abnormalities for long time are more prone for cardiovascular involvement and thus anaesthetic management needs to be tailored accordingly to provide smooth recovery and prevent the tempest that could occur.

References

1. Lavrentaki A, Paluzzi A, Wass JA, Karavitaki N. Epidemiology of acromegaly: review of population studies. Pituitary 2017;20:4-9.
2. L. Katznelson, E. R. Laws Jr., S. Melmed et al., "Acromegaly: an endocrine society clinical practice guideline," Journal of Clinical Endocrinology and Metabolism, vol. 99, no. 11, pp. 3933–3951, 2014.
3. Colao A, Grasso LFS, Giustina A, Melmed S, Chanson P, Pereira AM, et al. Acromegaly. Nat Rev Dis Primer 2019;5(1):20.
4. A. Colao, R. Baldelli, P. Marzullo et al., "Systemic hyper- tension and impaired glucose tolerance are independently correlated to the severity of the acromegalic cardiomyopathy," The Journal of Clinical En
5. A. M. Ramos-Levi and M. Marazuela, "Cardiovascular comorbidities in acromegaly: an update on their diagnosis and management," Endocrine, vol. 55, no. 2, pp. 346–359, 2017.
6. F. Grothues, G. C. Smith, J. C. Moon et al., "Comparison of interstudy reproducibility of cardiovascular magnetic reso- nance with two-dimensional echocardiography in normal subjects and in patients with heart failure or left ventricular hypertrophy," American Journal of Cardiology, vol. 90, no. 1, pp. 29–34, 2002
7. Dabir D, Child N, Kalra A, et al. Reference values for healthy human myocardium using a T1 mapping methodology: results from the International T1 multicenter cardiovascular magnetic resonance study. J Cardiovasc Magn Reson 2014;16:69
8. Kitahata LM. Airway Difficulties Associated With Anaesthesia In Acromegaly. Br J Anaesth 1971;43(12):1187–90.
9. Schmitt H, Buchfelder M, Radespiel-Tröger M, Fahlbusch R. Difficult Intubation in Acromegalic Patients. Anesthesiology 2000;93(1):110–4.
10. Nemergut EC, Zuo Z. Airway Management in Patients With Pituitary Disease: A Review of 746 Patients. J Neurosurg Anesthesiol 2006;18(1):73–7.
11. Ramos-Leví AM, Marazuela M. Cardiovascular comorbidities in acromegaly: an update on their diagnosis and management. Endocrine. 2017;55:346–359.
12. Jurcut R, Găloiu S, Florian A, et al. Quantifying subtle changes in cardio- vascular mechanics in acromegaly: a Doppler myocardial imaging study. J Endocrinol Invest. 2014;37:1081–1090.
13. Nair A, Nirale A, Sriprakash K, Gopal TVS. Dilated cardiomyopathy in acromegaly: Case report and anesthesia management. Anesth Essays Res 2013;7(3):411.
14. Davies MR, Cousins J. Cardiomyopathy and anaesthesia. Contin Educ Anaesth Crit Care Pain 2009;9(6):189–93.