

Doxorubicin-induced dilated cardiomyopathy for modified radical mastectomy: A case managed under cervical epidural anaesthesia

Address for correspondence:

Dr. Anuj Jain,
Sanjay Gandhi Institute of
Medical Sciences,
Lucknow - 226 016,
Uttar Pradesh, India.

E-mail: anuj.jain.mln@gmail.com

Anuj Jain, Kamal Kishore

Department of Anaesthesiology, Sanjay Gandhi Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

ABSTRACT

Doxorubicin (Dox) is an antineoplastic agent used in a wide variety of malignancies. Its use is limited because of a cumulative, dose-dependent irreversible cardiomyopathy. We report a case of Dox induced cardiomyopathy, posted for modified radical mastectomy. The patient had poor LV function along with moderate pulmonary hypertension. Regional anaesthesia was planned as the risk associated with general anaesthesia was more. A cervical epidural was placed and a block adequate for surgery could be achieved. The haemodynamic parameters as measured by esophageal doppler showed a stable trend. The surgery could be managed well under cervical epidural and also provided a good postoperative pain relief.

Key words: Adriamycin, cervical epidural, dilated cardiomyopathy, pulmonary arterial hypertension

Access this article online

Website: www.ijaweb.org

DOI: 10.4103/0019-5049.111852

Quick response code



INTRODUCTION

Doxorubicin (Dox) is an antineoplastic agent used in a wide variety of malignancies. Its use is limited because of a cumulative, dose-dependent irreversible cardiomyopathy observed in patients who receive a dose >550 mg/m².

Depleted level of Adenosine-5'-triphosphate (ATP) in the perfused heart due to uncoupling of oxidative phosphorylation following Dox treatment^[1] seems to be the most probable mechanism behind Dox-induced cardiomyopathy.

Serial echocardiographic measurement of the ejection fraction is a sensitive non-invasive tool for the primary detection and follow-up of Dox-induced cardiomyopathy. Dox-induced cardiomyopathy is accompanied by adrenergic denervation even before a decrease in ejection fraction can be observed by means of radionuclide angiography.

If the heart has been damaged by doxorubicin

treatment, options are few. Typically, doxorubicin induced cardiomyopathy and heart failure are refractory to conventional therapy.^[2,3] With cardiomyopathy, there is decreased myocardial beta-adrenergic receptor density or sensitivity of these receptors, so inotropic requirement may be higher.^[4,5]

CASE REPORT

The report is about a 58-yrs-old female with carcinoma breast who had received neoadjuvant chemotherapy (CTx) consisting of Dox. She was posted for modified radical mastectomy (MRM). Pre-anaesthetic checkup (PAC) revealed Dox-induced cardiomyopathy. Patient had fatigability ever since the start of chemotherapy. On clinical examination, she had New York Heart Association (NYHA) grade 2 dyspnoea, heart rate 96/min, normal sinus rhythm, Blood Pressure (BP) 136/86 mmHg right arm supine position, pedal oedema no murmur, jugular venous pressure (JVP) was raised, fine crepitation in bilateral bases and generalised weakness since the start of chemotherapy (CTx) which has persisted even after

How to cite this article: Jain A, Kishore K. Doxorubicin-induced dilated cardiomyopathy for modified radical mastectomy: A case managed under cervical epidural anaesthesia. *Indian J Anaesth* 2013;57:185-7.

completion of CTx. Electrocardiogram (ECG) revealed sinus tachycardia with left axis deviation and left ventricular hypertrophy. In chest, roentgenogram cardiothoracic ratio was 65% with mild basilar congestion. Echocardiography (ECHO), before starting chemotherapy, was a normal study. Post CTx ECHO showed Left ventricular end systolic size (LVES): 57 mm, Left ventricular end diastolic size (LVED): 70 mm, Left atrial diameter: 40 mm, Ejection Fraction: 25% and moderate Pulmonary artery hypertension (PAH). Rest all investigations were normal.

Regional anaesthesia was planned owing to the high risk involved with general anaesthesia (GA) and consent for cervical epidural was obtained.

Informed consent was obtained with special mention to possibility of failed epidural block or epidural-related complications such as respiratory depression, hypotension, cervical cord injury or epidural hematoma leading to quadriplegia and a need for postoperative ventilator support and need to administer GA in need of an emergency. The patient was also assured about the established safety of cervical epidural in trained hands.

Monitoring utilised for the procedure included five lead ECG with ST segment monitoring, pulseoximeter (SPO₂), invasive blood pressure and central venous pressure monitoring, Esophageal Doppler (CardioQ ODM) and Bispectral index score (BIS).

Cervical epidural was placed in the C6-7 space in sitting position using 18G touhy needle and epidural space identified using the hanging drop method. The catheter was directed downwards ensuring 4 cm of catheter in the epidural space. After catheter placement, patient was made to lie supine on the table. Three ml of lignocaine 2% with adrenaline 1:200,000 was injected as the test dose after aspiration for cerebrospinal fluid (CSF). After a normal response to test dose, 12 ml bupivacaine 0.25% with 2 mg morphine was administered

over 5 minutes in graduated doses while monitoring for the haemodynamic response. After 15 min of injection level of block was assessed. Adequate level of anaesthesia was obtained extending from C3 to T6. Patient was given sedation using midazolam in 2 mg in aliquots of 0.5 ml each and infusion of propofol was started and titrated to obtain a BIS of 60-80.

Apart from slight discomfort while dissecting the breast tissue in its caudad extent, for which 4 ml lignocaine 2% was given in the epidural space, MRM could proceed without any major problem and the patient remained extremely stable throughout out the surgery [Table 1].

Patient was shifted to the post anaesthesia care unit (PACU) with the specific order to look for respiratory depression, excessive somnolence and hypotension. Maximum visual analogue score (VAS) for pain up to 24 hrs after surgery was 2 and she did not require any analgesic in the postoperative phase.

DISCUSSION

This case is worth mentioning because, firstly Dox-induced cardiotoxicity of this severity is less common; secondly, although there are case series of MRM under cervical epidural but those are in American Society of Anaesthesia physical state (ASA) 1 and 2 patient, here we performed the procedure in an ASA3 patient owing to the high possibility of GA-associated complication. Thirdly, we successfully used a relatively new technique of haemodynamic monitoring in the form of Oesophageal Doppler^[6] for optimising the fluid therapy to the patient.

Anaesthetic management of patients with cardiomyopathy with reduced systolic function is challenging and may be associated with high mortality. Anaesthetic challenge in this case was to maintain the systolic function as far as possible and prevent the increase in after load to left ventricle and an accurate fluid management. Aono reported

Table 1: Haemodynamic trends during the surgery

| Time | Heart rate | Blood pressure | Respiratory rate | BIS | Central venous pressure | Doppler parameters |
|----------|------------|----------------|------------------|-----|-------------------------|--|
| Baseline | 96/min | 145/86 mmHg | 18/min | 96 | 14 mmHg | CO = 3.6 l/min, SV = 38 ml, FTC = 300 msec, PV = 68 cm/sec |
| 30 min | 81/min | 130/70 mmHg | 16/min | 78 | 12 mmHg | CO = 3.8 l/min, SV = 48 ml, FTC = 312 msec, PV = 78 cm/sec |
| 60 min | 82/min | 132/72 mmHg | 12/min | 75 | 16 mmHg | CO = 4.1 l/min, SV = 50 ml, FTC = 330 msec, PV = 80 cm/sec |
| 90 min | 80/min | 126/68 mmHg | 14/min | 68 | 12 mmHg | CO = 4.2 l/min, SV = 53 ml, FTC = 330 msec, PV = 81 cm/sec |
| 120 min | 81/min | 124/64 mmHg | 15/min | 78 | 11 mmHg | CO = 4.2 l/min, SV = 54 ml, FTC = 340 msec, PV = 83 cm/sec |
| 150 min | 78/min | 120/60 mmHg | 12/min | 74 | 15 mmHg | CO = 4.4 l/min, SV = 57 ml, FTC = 370 msec, PV = 80 cm/sec |
| 180 min | 76/min | 126/64 mmHg | 14/min | 79 | 16 mmHg | CO = 4.3 l/min, SV = 57 ml, FTC = 365 msec, PV = 78 cm/sec |

CO – Cardiac output; SV – Stroke volume; FTC – Corrected flow time; PV – Peak velocity; BIS – Bispectral index score

that, GA could not suppress stress response of both hypothalamus-pituitary-adrenocortical axis and sympathoadrenergic system while Epidural anaesthesia (EA) suppressed the sympathoadrenal responses.^[7] EA with morphine as adjuvant offers satisfactory analgesia with a relatively slow sympathetic blockade as well as decreased peripheral vascular resistance. Hashimoto suggested that this induced reduction in afterload and preload benefits cardiac function.^[8] Gramatica used EA as a sole technique for laparoscopic cholecystectomy and recommended it for patients who are not good candidates for GA due to cardiorespiratory problems.^[9] Hashimoto reported that epidural anaesthesia is an anaesthetic method of choice for patients with Doxorubicin-induced dilated cardiomyopathy (DCM).^[8]

CONCLUSION

Severe cardiomyopathy must not be missed in a patient who has received Doxorubicin chemotherapy.

ACKNOWLEDGMENT

I thank Dr. Kamal Kishore, Assistant Professor at Department of Anaesthesia at Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, India, for lending his expert guidance while performing the cervical epidural and encouraging me to write a case report on it.

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Source of Support: Nil, **Conflict of Interest:** None declared