Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Perioperative care of Chondrosarcoma anterior chest wall: A Case Report

Manisha Sahoo
All India Institute of Medical Sciences
Priya Singla
All India Institute of Medical Sciences
Sandeep Bhoriwal
All India Institute of Medical Sciences
Nishkarsh Gupta
drnishkarsh@rediffmail.com

All India Institute of Medical Sciences

Case Report

Keywords: Chondrosarcoma, Difficult airway, Fiberoptic, One lung ventilation, Prosthesis

Posted Date: April 26th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9141290/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Chondrosarcoma, a rare malignant bone tumor, requires wide en bloc resection to achieve oncologic clearance, often resulting in large chest wall defects, necessitating reconstruction to restore stability and preserve respiratory function. Extensive chest wall resection and reconstruction remain associated with significant perioperative challenges, including postoperative pain, altered respiratory mechanics, and increased risk of pulmonary complications. Existing literature predominantly focuses on surgical and oncologic outcomes, with limited emphasis on perioperative anesthetic and analgesic management, particularly in the context of rigid chest wall reconstruction and free flap coverage. Integration of prehabilitation and multimodal analgesia techniques in such setting is sparsely described.

Case Presentation

This case report addresses this gap by highlighting the perioperative clinical dilemma of balancing effective analgesia with preservation of respiratory function and early recovery in a patient undergoing anterior chest wall chondrosarcoma resection with titanium prosthesis reconstruction and an anterolateral thigh flap, thereby offering practical insights for anesthesiologists managing similar cases. Perioperative challenges included airway difficulty, hemodynamic instability, analgesia managemet, hypothermia and weaning failure.

Conclusion

Multidisciplinary planning and individualized anesthetic and analgesic strategies are essential for such extensive surgeries. Anticipation and preparedness for any complication are key determinants of favourable outcomes in such complex oncological surgeries.

Background

Chondrosarcomas are malignant bone tumors that typically present in the fifth to sixth decade of life[1] and are primarily managed surgically, as they demonstrate limited responsiveness to radiotherapy[2]. In the present case, extensive tumor involvement necessitated radical resection of the entire sternum, partial claviculectomy, and excision of seven ribs, resulting in a large anterior chest wall defect. Such extensive resection poses a significant risk of postoperative chest wall instability and flail chest physiology, making perioperative respiratory optimization a critical determinant of outcome. Restoration of thoracic cage integrity using rigid prosthetic materials such as titanium plates and mesh has become an accepted reconstructive strategy to prevent paradoxical chest wall motion and preserve ventilatory function.

Case presentation

A male patient in his fifth decade with biopsy-proven chondrosarcoma of the anterior chest wall was referred to our tertiary oncological center for wide local excision and chest wall reconstruction using a titanium prosthesis with an anterolateral thigh (ALT) flap cover. The patient had previously undergone radiotherapy at another institution three years earlier; however, the tumor demonstrated progressive enlargement rather than a therapeutic response.

Preoperative evaluation was undertaken with a multidisciplinary approach, considering the size, location, and anticipated physiological impact of the tumor and subsequent reconstruction. Pre-anesthesia assessment revealed controlled systemic hypertension managed with a combination of amlodipine and chlorthalidone (5 mg/12.5 mg). The patient had a remote history of inguinal hernia repair during adolescence. Clinical examination revealed resting tremors, and a diagnosis of autosomal dominant cerebellar ataxia was established by the neurology team for which, beta-blocker therapy (propranolol 20 mg) was planned to be started postoperatively. Local examination demonstrated a large anterior chest wall mass measuring approximately 22 × 21 cm (Figure b). There were no symptoms suggestive of airway or esophageal compression, including orthopnea, platypnea, dysphagia, hoarseness of voice, or stridor. Baseline functional capacity was preserved, with incentive spirometry volumes of 1200–1500 mL. Chest radiography showed rightward tracheal deviation without evidence of luminal compression (Figure a). Contrast-enhanced computed tomography of the thorax revealed a sternal-origin mass extending from the manubrium sterni to the xiphoid process, abutting the superior vena cava and the aortic arch, without radiological features of invasion. Given the tumor's size and location, a tailored preoperative anesthetic and respiratory assessment was undertaken. Airway evaluation suggested an anticipated difficult airway due to tracheal displacement, restricted neck mobility, and a Modified Mallampati grade IV. Pulmonary function testing demonstrated a mild obstructive ventilatory defect. These findings, combined with the planned rigid chest wall reconstruction using titanium plates, prompted focused evaluation of baseline respiratory function to anticipate postoperative changes in lung volumes and chest wall compliance. As part of a structured prehabilitation program, the patient was sent to physiotherapist and was instructed for incentive spirometry, diaphragmatic and abdominal breathing techniques, and deep breathing exercises to optimize pulmonary reserve and facilitate postoperative recovery. The patient was also extensively counseled regarding the anticipated perioperative course, including the potential impact of chest wall reconstruction on respiratory mechanics, pain management strategies, and the importance of early participation in postoperative respiratory therapy. On the day of surgery, nil per oral (NPO) status was confirmed, and standard American Society of Anesthesiologists (ASA) monitoring was instituted. An 18-gauge intravenous cannula was secured in the upper limb prior to induction. In view of the anticipated extensive chest wall resection and severe postoperative pain, bilateral ultrasound-guided erector spinae plane (ESP) catheters were placed pre-induction at the T3–T4 vertebral level keeping in mind the incision congruence. Neuraxial epidural analgesia was deliberately avoided due to the anticipated requirement for intraoperative anticoagulation. Following ESP catheter placement, intrathecal morphine (450 µg) was administered at the L3–L4 interspace to supplement postoperative analgesia. After confirming ease of mask ventilation, general anesthesia was induced, and airway management was planned as fiberoptic-guided oral intubation due to the predicted difficult

airway. Fiberoptic intubation was performed through an oral airway following induction; however, additional maneuvers including jaw thrust and videolaryngoscopy (C-Mac) to elevate the epiglottis were required to facilitate successful endotracheal tube placement (Figure c). Subsequently, a second wide-bore intravenous access, an invasive arterial line, and a urinary catheter were placed. The surgical procedure was conducted in the supine position. Surgical procedure involved excision of the mass, ribs(1st to 7th) till anterior axillary line followed by reconstruction using the mesh as well as titanium plate which was anchored to cut edge of the ribs. Additionally, Anterior lateral thigh flap of size 24*26 cm was employed for the coverage (Figure d).

Intraoperative Challenges and Management

Ventilatory Challenges

During tumor excision, significant external compression of the lungs occurred, resulting in impaired ventilation and oxygenation. Fiberoptic bronchoscopy demonstrated compression of the left main bronchus. In coordination with the surgical team, the mass was temporarily elevated away from the lung fields by the surgeon, allowing advancement of a flexible reinforced endotracheal tube into the right main bronchus to achieve one-lung ventilation. Right-sided one-lung ventilation was maintained for approximately two hours until complete tumor excision, after which the tube was repositioned into the trachea under fiberoptic guidance.

Hypothermia

The prolonged surgical duration and extensive exposure of body surface area led to significant intraoperative hypothermia(minimum recorded nasopharyngeal temperature was 32 degree Celsius) despite the use of forced-air warming devices and warmed intravenous fluids. Additional active warming measures were instituted, including the application of two supplementary forced-air warming systems and implementation of low-flow anesthesia to reduce heat loss. These measures facilitated gradual restoration of normothermia.

Metabolic Acidosis

Serial arterial blood gas analyses revealed metabolic acidosis secondary to elevated lactate levels, likely attributable to hypovolemia, prolonged surgical stress, and hypothermia. This was managed conservatively with volume optimization, active rewarming, and ongoing physiological correction, resulting in gradual normalization of metabolic parameters.

Postoperative Course

The surgical procedure lasted approximately 21 hours. Postoperatively, the patient was managed in intensive care unit with a tracheostomy in situ and required vasopressor support with noradrenaline at 0.2 µg/kg/min. Tracheostomy was electively performed to facilitate controlled ventilatory weaning, optimize pulmonary toileting, and minimize respiratory complications in the immediate postoperative period. Patient was gradually weaned off on postoperative day (POD)1. Pain control remained satisfactory with the multimodal regimen, enabling early participation in respiratory physiotherapy. The patient was weaned off vasopressor support within the early postoperative period, and flap viability remained uncompromised. However, he developed Hospital acquired pneumonia (HAP)on POD3 for which he again had a ventilator requirement. Culture sensitive antibiotics were started, along with pulmonary toileting but patient subsequently developed septic shock and he passed away on POD11.

Discussion And Conclusion

This patient underwent extensive resection which was a significant risk of postoperative chest wall instability and flail chest physiology. Chest wall stability was restored using a rigid titanium prosthetic system anchored to the cut ends of the ribs, followed by soft-tissue coverage with an anterolateral thigh (ALT) flap. The ALT flap, harvested as a musculocutaneous flap incorporating the vastus lateralis muscle, provided adequate bulk, vascularized coverage, and contour restoration for the large defect. The flap was transferred using microsurgical techniques and inset to ensure complete coverage of the prosthesis and surrounding exposed structures. While rigid prosthetic reconstruction is essential to prevent paradoxical chest wall movement, fixation of titanium plates to the ribs can restrict physiological “bucket-handle” rib motion, thereby reducing chest wall compliance. In this patient, chest expansion was expected to be predominantly dependent on the lateral thoracic cage and diaphragmatic excursion. Anticipating these biomechanical limitations, perioperative strategies focused on optimizing pain control and respiratory mechanics to facilitate effective ventilation, coughing, and secretion clearance. Multimodal analgesia was employed to mitigate postoperative pain and support pulmonary rehabilitation. Continuous bilateral erector spinae plane (ESP) catheter infusions with local anesthetics formed the cornerstone of analgesia, supplemented with systemic paracetamol, diclofenac, and gabapentin from postoperative day (POD) 1. This approach enabled improved incentive spirometry performance and effective cough, both essential for preventing pulmonary complications in the setting of reduced chest wall compliance. Airway management was a major perioperative concern due to restricted neck mobility, superior tumor extension up to the sternal notch, tracheal deviation, and unfavorable airway anatomy. Although the airway lumen remained patent, these features warranted a planned fiberoptic-guided intubation strategy with readiness for alternative airway rescue techniques.. Upfront tracheostomy would have also been difficult in this case due to restricted neck movements. Hence, a fiberoptic-guided intubation was planned. This surgery was done for the first time in our institute, though similar cases were done and case reports were published[2–4]. There was a case of sternal chondrosarcoma arising from the posterior surface of the sternum, which mimicked an anterior mediastinal mass and presented with dyspnea[5]. However, none of them had a large mass or involved resection of multiple bony structures compared to this. The prolonged surgical duration and extensive exposure predisposed the patient to

significant intraoperative hypothermia, despite standard warming measures. Aggressive temperature management—including multiple forced-air warming devices, warmed intravenous fluids, and low-flow anesthesia—was required to restore normothermia by the end of surgery. Post-excision vasopressor support with noradrenaline was initially necessary but was carefully titrated due to concerns regarding free-flap perfusion. Optimization of hemoglobin concentration and intravascular volume allowed gradual discontinuation of vasopressor support. Strict fluid balance, urine output monitoring, and glycemic control were maintained throughout the intraoperative period. This case, being the first of its kind in our institute, caused a lot of apprehension for both the surgical and anesthesiology teams. The key to an early recovery is a proper surgical, anesthesia and analgesia plan, good communication between both teams and patients, explaining the expectations from either party, and implementing a good prehabilitation plan. Patient and family members should be appropriately counselled regarding things that could go wrong and ways to have a smooth post-operative period.

Abbreviations

ALT
Antero-Lateral Thigh
NPO
Nil Per Oral
ASA
American Society of Anesthesiologists
ESP
Erector Spinae Plane
POD
Post Operative Day
HAP
Hospital Acquired Pneumonia

Declarations

Ethics approval and consent to participate:

Not applicable

Consent for publication:

Taken. Written consent was taken from their next of kin

Clinical Trial Number

Not applicable

Competing interests:

None

Funding:

None

Author Contribution

All the authors were directly involved in patient management. NG was the chief anesthesiologist and SB, the lead surgeon and contributed to manuscript writing. MS and PS collected the data and were involved in manuscript writing. All authors read and approved the final manuscript.

Acknowledgement

We are grateful to the Nursing and technical staff of O.T. and I.C.U.

Availability of data and materials:

Not applicable

References

1. Collins MS, Koyama T, Swee RG, Inwards CY. Clear cell chondrosarcoma: radiographic, computed tomographic, and magnetic resonance findings in 34 patients with pathologic correlation. Skeletal Radiol. 2003 Dec 1;32(12):687–94.
2. He B, Huang Y, Li P, Ye X, Lin F, Huang L, et al. A rare case of primary chondrosarcoma arising from the sternum: A case report. Oncol Lett. 2014 Nov;8(5):2233–6.
3. Ersöz E, Evman S, Alpay L, Akyıl M, Vayvada M, Gürer D. Chondrosarcoma of the anterior chest wall: surgical resection and reconstruction with titanium mesh. J Thorac Dis. 2014;6(10).
4. Liu D, Wang Z, Qiu T, Hou F, Qin Y, Shen Y, et al. Resection of a giant sternal chondrosarcoma and chest wall reconstruction: a case report. Ann Transl Med. 2021 Nov;9(22):1706–1706.
5. Alpert JB, Nonaka D, Chachoua A, Pass HI, Ko JP. Increasing Dyspnea Due to an Anterior Mediastinal Mass. Chest. 2011 Jan;139(1):217–23.

Figures



Figure 1

In clockwise manner- a- Chest X-Ray Image- PA and Lateral View; b- Preoperative image of the patient in sitting position showing the mass; c- External compression; d- Collage of peri-operative lesion- mass, excision, placement of cage, closure with flap