Resection and Individualized Chest Wall Reconstruction for Sternal Osteochondroma Complicated by Superficial Postoperative Wound Infection: A Case Report

Ann. Ital. Chir., 2026 97, 11: 1946–1950
https://doi.org/10.62713/aic.4935

Xiaoping Wei[1], Cheng Wang[1], Bin Li[1], Peng Jiang[1], Yuqi Men[1]

[1]Department of Thoracic Surgery, The Second Hospital & Clinical Medical School, Lanzhou University, 730030 Lanzhou, Gansu, China

AIM: Sternal resection for sternal tumors may result in complex, full-thickness anterior chest wall defects. Chest wall reconstruction in this setting remains surgically challenging, with postoperative wound infection and prosthesis exposure representing common and troublesome complications. This case report aimed to describe a multidisciplinary reconstructive strategy and the long-term clinical outcome of a patient with a complex sternal defect.

CASE PRESENTATION: A 48-year-old female patient with locally aggressive benign sternal osteochondroma underwent extended en bloc sternal tumor resection, resulting in a 10 × 12 cm chest wall defect. She underwent combined reconstruction using titanium mesh fixation, an omental flap, and bilateral pectoralis major muscle advancement flaps. Superficial wound infection with methicillin-resistant staphylococcus epidermidis (MRSE) occurred on postoperative day 14 without deep prosthesis infection.

RESULTS: The patient was treated with thorough debridement, standardized vacuum-assisted closure (VAC) therapy, and targeted antibacterial treatment with linezolid. The wound infection was completely controlled, microbiological sampling from the prosthesis interface remained negative, and secondary flap repair achieved complete wound healing. During more than four years of clinical follow-up, no prosthesis removal, tumor recurrence, or severe complications were reported, and thoracic wall function remained intact.

CONCLUSIONS: Multidisciplinary collaboration between thoracic surgery, plastic surgery, and oncology teams may be beneficial for complex sternal tumor resection and reconstruction. In this case, the integrated strategy combining rigid titanium mesh skeletal support, dual-flap soft-tissue reconstruction, and VAC wound care was associated with successful wound healing and prosthesis preservation despite postoperative superficial wound infection, suggesting its potential feasibility in selected patients.

Keywords: sternum resection; chest wall reconstruction; titanium mesh; omental flap; pectoralis major muscle flap; vacuum-assisted closure; postoperative wound infection; case report

Introduction

Sternal neoplasms are rare and are classified as primary sternal tumors, locally invasive malignant lesions, or metastatic tumors [1,2,3,4,5]. Benign sternal tumors are extremely rare, often remain asymptomatic in early stages, but the majority can be cured with radical surgical resection [3,6,7,8,9]. For full-thickness chest wall reconstruction, rigid titanium mesh offers superior physicochemical properties for bony defect repair. Despite several available soft-tissue flaps, pectoralis muscle flaps remain the preferred option for sternal reconstruction because of their robust vascularity and preservation of function [2,3]. Local infection constitutes the most prevalent surgical site complication following chest wall resection and reconstruction. Failure of antibiotic therapy and persistent wound infection may necessitate reoperation. Furthermore, prosthesis removal becomes necessary in patients with severe infection [9]. Therefore, vacuum-assisted closure (VAC) therapy can serve as a valuable tool for controlling local infection after chest wall resection and reconstruction, thereby avoiding the consequences of prosthesis removal secondary to further prosthetic infection.

Case Presentation

A 48-year-old woman presented to The Second Hospital & Clinical Medical School, Lanzhou University with a 4-year-history of a gradually enlarging anterior chest wall mass. Over the last six months, she complained of intermittent anterior chest discomfort, which had gradually worsened over time. Physical examination identified an 8 × 8 × 2 cm mass adherent to the upper sternum. The mass was moderately painful on palpation and accompanied by a pressure sensation over the pectoral region, and no pulsation was noted. According to reconstructed chest computed tomography images, an 8 × 8 × 4 cm osseous tumor was identified in the manubrium sterni (Fig. 1a). Contrast-enhanced chest

Submitted: 4 August 2026 Revised: 14 August 2026 Accepted: 18 September 2026 Published: 10 November 2026
Correspondence to: Xiaoping Wei, Department of Thoracic Surgery, The Second Hospital & Clinical Medical School, Lanzhou University, 730030 Lanzhou, Gansu, China (e-mail: dr_weixp@163.com); Cheng Wang, Department of Thoracic Surgery, The Second Hospital & Clinical Medical School, Lanzhou University, 730030 Lanzhou, Gansu, China (e-mail: wangchengxw123@sina.com).
Editor: Andrea Zuin

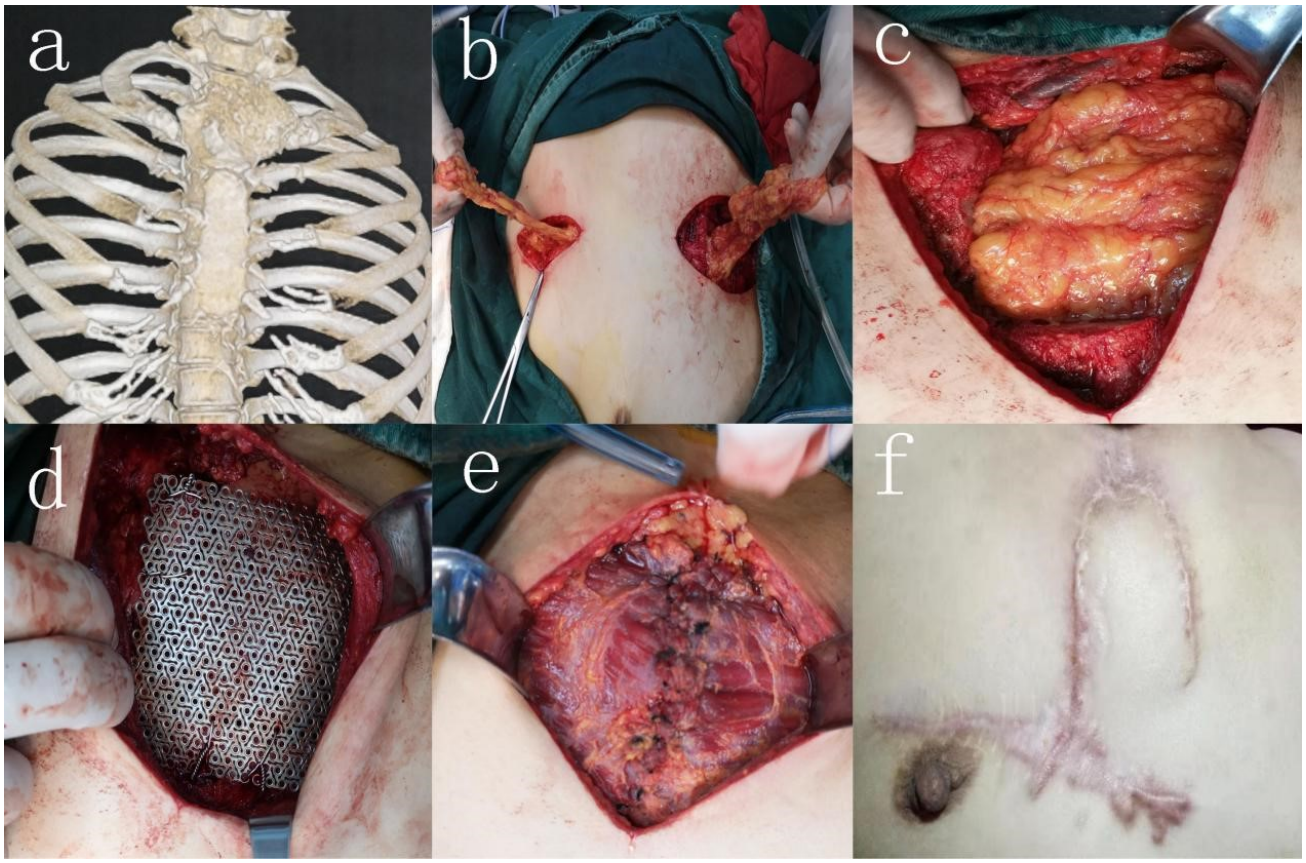


Fig. 1. Preoperative imaging and intraoperative procedures for sternal tumor resection and individualized chest wall reconstruction. (a) Computed tomography (CT) 3D reconstruction demonstrates an 8 × 8 × 4 cm osseous tumor located in the manubrium sterni. (b) During surgery, the omentum was harvested to fill the intrathoracic dead space via a diaphragmatic window. (c) Interposition of the omental flap was performed to obliterate the intrathoracic cavity. (d) A titanium mesh was applied for reconstruction of the upper sternum and bilateral sternoclavicular joints. (e) Bilateral pectoralis major muscle flaps were mobilized to cover the titanium mesh prosthesis. (f) A pedicled skin flap was transferred to repair the residual chest wall skin defect.

computed tomography (CT) clearly delineated the anatomical margins of the sternal lesion, which was confined within the sternum without invasion or mass-effect compression of adjacent great vessels and mediastinal structures. Preoperative whole-body bone scanning revealed no abnormal tracer uptake indicative of distant osseous metastasis or other primary malignant bone neoplasms. Taken together with the preoperative biopsy findings, these results excluded metastatic disease and alternative primary malignant bone neoplasms prior to surgery. This case has been reported in line with the case report guidelines: Case Report (CARE) Guidelines to ensure the accuracy and completeness of the report (**Supplementary Material**).

Results

Histopathologic examination of biopsy specimens confirmed the lesion as benign osteochondroma. The patient had no remarkable past medical history, drug allergies, or smoking history. Preoperative laboratory results and cardiopulmonary function were normal.

Based on the patient's pathological conditions, complete full-thickness surgical resection was indicated. A comprehensive preoperative assessment was conducted by a multidisciplinary team (MDT), composed of specialists in thoracic surgery, plastic surgery and oncologist. Definitive surgical resection was subsequently planned and performed. Primary benign neoplasms arising from the sternum represent a relatively rare clinical entity, among which osteochondromas constitute only a small proportion. Preoperative imaging revealed broad-based tumor growth originating from the sternum, with local cortical destruction and compression of adjacent soft tissues. Clinically, the patient presented with rapid mass enlargement over a short period and persistent compressive chest pain secondary to the lesion's mass effect. Notably, although histologically benign, this osteochondroma harbored locally aggressive biological behavior. For such benign but locally aggressive bone lesions, marginal resection is associated with a high risk of local recurrence. Currently, surgical intervention serves as the primary treatment for symptomatic sternal tumors, regardless of whether they are benign or malignant

[10,11]. Accordingly, extended en bloc resection was performed in the present case instead of limited intralesional excision. Intraoperatively, en bloc resection of the sternal manubrium, the superior one-third of the sternal body, the bilateral medial clavicular heads, and the first two ribs was performed, with a uniform safe surgical margin of 2 cm secured throughout the entire resection plane. The manubrial tumor was completely resected en bloc. The resected specimen consisted of the manubrium sterni and its surrounding structures, involving the bilateral medial clavicular heads and parasternal segments of the first and second ribs.

This resection resulted in a 10 × 12 cm chest wall defect on the anterior thoracic wall. We opted for reconstruction with titanium mesh implantation and omental flap interposition to obliterate the intrathoracic dead space (Fig. 1b). During laparotomy, the omental flap was harvested and passed through the diaphragm to fill the intrathoracic dead space (Fig. 1c). The flap was based on the right gastroepiploic vascular pedicle. During dissection, the gastroepiploic arcade was meticulously preserved to ensure adequate flap perfusion. Omental tissue beyond the vascular territory was discarded. To facilitate transposition of the omental flap from the abdominal cavity into the thoracic cavity, diaphragmatic fenestration was performed. The fenestration was sized appropriately to prevent kinking or compression of the vascular pedicle; the margins of the diaphragmatic defect were loosely sutured around the pedicle to avoid vascular constriction and minimise abnormal abdominothoracic communication. Titanium mesh implantation was performed for reconstruction of the upper sternum and bilateral sternoclavicular joints (Fig. 1d). The titanium mesh used for reconstruction was 1.2 mm thick with a uniform aperture size of 1.5 mm. Intraoperatively, the mesh was tailored and contoured to conform to the anatomical configuration of the chest wall defect. Its peripheral margins were rigidly secured to the residual sternum, ribs, and clavicular stumps using titanium screws and steel wires. We implanted a titanium mesh to repair the osseous defect, which was secured to the sternal body and residual clavicles and tensioned toward all rib stumps. Bilateral pectoralis major muscle advancement flaps were mobilized to reconstruct the soft-tissue defect and fully cover the implanted titanium mesh (Fig. 1e). The surgery was successful, and the reconstruction of the chest wall was satisfactory in both appearance and function. Histopathological analysis of the resected specimen verified a final diagnosis of benign osteochondroma, and the initial postoperative recovery was uneventful.

However, on postoperative day 14, the patient developed worsening chest pain accompanied by dehiscence of the superior margin of the sternal wound with purulent drainage, while remaining afebrile. The patient was subsequently referred to the plastic surgery team. After transfer to the Department of Plastic Surgery, the patient received VAC therapy followed by secondary wound reconstruction using a pedicled skin flap, resulting in complete wound healing (Fig. 1f) and cefoperazone–sulbactam was initially administered for empirical anti-infective therapy. During treatment in the Department of Plastic Surgery, wound culture returned positive for methicillin-resistant staphylococcus epidermidis (MRSE), prompting modification of the antimicrobial regimen. Multiple microbial cultures were performed on superficial wound specimens, including skin, subcutaneous tissue, and muscle, all of which yielded positive microbial growth. In contrast, repeated intraoperative swab cultures taken directly from the titanium mesh were consistently negative. Histopathological examination of the peri-prosthetic tissues was not available. Combined with intraoperative macroscopic observations, these laboratory results confirmed that the infection was confined to superficial soft tissues without implant-associated infection. Meanwhile, repeat chest CT revealed no radiological signs suggestive of deep infection beneath the titanium mesh, including peri-prosthetic fluid and air accumulation [9]. She underwent wound debridement followed by two weeks of vacuum-assisted wound closure therapy (Fig. 2a), VAC therapy was delivered at a negative pressure of −125 mmHg with continuous suction. Dressing changes were performed every 5 days. Subsequent wound culture yielded MRSE. Guided by the antibiogram results, the patient was treated with a 2-week course of linezolid. Linezolid was administered intravenously at a dose of 600 mg every 12 hours. Upon removal of clean wound dressings, serial pus cultures yielded no bacterial growth. Subsequently, the white blood cell count was within the normal range (7.53×10^9/L), while the C-reactive protein level was 14.0 mg/L. The serum procalcitonin level was 2.37 ng/mL. The wound exhibited sustained healing, and secondary wound revision was conducted two weeks later. Intraoperative exploration revealed no evidence of prosthetic material infection. Plastic surgeons performed wound coverage using a pedicled skin flap. The postoperative period was uneventful. Follow-up computed tomography performed three years postoperatively showed no evidence of tumor recurrence or prosthesis-related complications (Fig. 2b). Clinical follow-up continued for more than four years, whereas the latest available follow-up CT was performed three years postoperatively.

The patient received vacuum-assisted closure therapy for the management of postoperative wound infection [12]. Soft-tissue reconstruction requires close collaboration between thoracic and plastic surgeons [7,9]. VAC therapy has been reported as a valuable therapeutic modality for controlling local infection after chest wall resection and reconstruction [9], with the potential to reduce the need for prosthesis removal. Previous studies have described various reconstructive approaches following sternal tumor resection, including rigid prosthetic reconstruction combined with soft-tissue flap coverage [3,4,5,11]. However, direct comparisons of surgical extent, postoperative infection

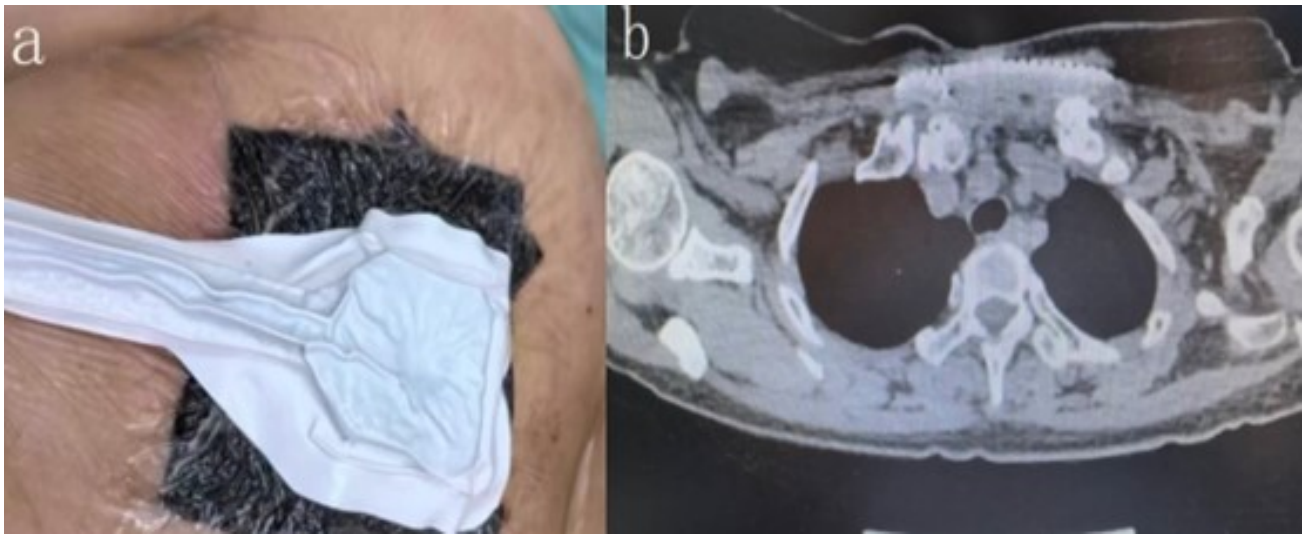


Fig. 2. Postoperative wound management and long-term imaging follow-up. (a) Vacuum-assisted closure (VAC) therapy was applied for postoperative sternal wound infection. (b) Three-year postoperative follow-up CT showed complete wound and thoracic reconstruction recovery with no abnormal lesions or prosthesis-associated complications.

management, prosthesis retention, and long-term functional outcomes remain limited, particularly for benign sternal osteochondroma. In the present case, extensive sternal resection followed by titanium mesh and flap reconstruction was complicated by superficial wound infection, which was successfully managed with debridement, VAC therapy, and targeted antibiotic treatment without prosthesis removal. The favorable long-term outcome suggests the potential feasibility of prosthesis preservation in carefully selected patients, although the findings cannot establish comparative effectiveness or predict prosthesis salvage rates. However, further research is warranted to clarify the optimal protocols for integrating VAC therapy to mitigate infectious complications in this clinical setting. Our clinical experience indicates that prosthesis removal should not be routinely performed solely due to superficial wound infection. Nevertheless, this conservative strategy is not universally applicable and entails important risks and limitations. Conservative management with implant retention may be considered in appropriately selected patients, including those with superficial surgical-site infection, no deep peri-implant abscess or implant exposure, absence of clinical manifestations of infection such as fever, together with favorable clinical and laboratory responses to treatment, multiple swabs obtained from the implant surface yielding negative culture results, adequate wound drainage achievable through debridement or VAC therapy, causative pathogens susceptible to systemic antimicrobial agents, and good host immune status. By contrast, implant removal is strongly indicated for patients with deep-seated peri-prosthetic infection, confirmed biofilm formation on the prosthesis, infected bone and cartilage, persistent infection refractory to debridement and targeted antimicrobial therapy, or immunocompromised status [9,13]. In the present case, the infection was confined to superficial soft tissues without evidence of mesh infection. The titanium mesh was successfully retained following adequate debridement, VAC therapy, and targeted antibiotic treatment, with no prosthesis-related complications observed during follow-up. Given the patient's remote place of residence, follow-up was performed via telephone interview. The patient denied exertional chest tightness or chest pain. The 6-minute walk test (6MWT) distance was approximately 600 m. During the stair-climbing test, the patient could climb 5 floors (approximately 150 steps) in one attempt without obvious dyspnea. This case report has several limitations. As a single-patient observation, the findings have limited generalizability and cannot establish the reproducibility or comparative effectiveness of the reconstructive strategy. Furthermore, although long-term follow-up suggested satisfactory functional recovery, standardized functional assessment scales and systematic objective longitudinal measurements were not available, limiting a comprehensive evaluation of long-term functional outcomes. Further studies involving larger patient cohorts and standardized follow-up assessments are needed to validate these observations.

Conclusions

Extended resection and individualized chest wall reconstruction using titanium mesh and soft-tissue flaps achieved satisfactory reconstructive and long-term clinical outcomes in this patient with sternal osteochondroma. The postoperative superficial wound infection was successfully managed with debridement, VAC therapy, targeted antibiotic treatment, and subsequent wound reconstruction, while the uninfected titanium mesh was retained. This case suggests that conservative management may be feasible in selected patients with superficial wound infection and no evidence

of implant-associated infection. However, further studies are needed to validate this approach.

Availability of Data and Materials

The data analyzed are available from the corresponding authors upon reasonable request. Raw data cannot be shared publicly owing to patient privacy and confidentiality constraints.

Author Contributions

Conceptualization: CW. Data curation, investigation, visualization, original draft writing and preparation: XW. Data acquisition and resources: BL. Data acquisition, investigation and patient follow-up: PJ. Data acquisition and manuscript review: YM. All authors have been involved in revising the manuscript critically for important intellectual content. All authors gave final approval of the version to be published. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

Ethics Approval and Consent to Participate

The study was approved by the Ethics Committee of Department of Thoracic Surgery, The Second Hospital & Clinical Medical School, Lanzhou University (No.2026A-838). This study complied with local legislation and institutional requirements. The patient gave written informed consent to take part in the research, and separate consent was obtained for the publication of all potentially identifiable images and data included in this manuscript. This study was performed in accordance with the principles of the Declaration of Helsinki.

Acknowledgment

The authors sincerely thank the patient for participating in this study and agreeing to the publication of relevant clinical data. We are grateful to the clinical medical team for their dedicated work in patient treatment and long-term follow-up, as well as the institution for providing support for this research.

Funding

This study was supported by the Lanzhou Municipal Science and Technology Program Projects (2023-2-41).

Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.62713/aic.4935.

References

[1] Arnold PG, Pairolero PC. Chest-wall reconstruction: an account of 500 consecutive patients. Plastic and Reconstructive Surgery. 1996; 98: 804–810. https://doi.org/10.1097/00006534-199610000-00008

[2] Girotti PNC, Bianchi F. Chest wall reconstruction, prosthesis and allografts: a narrative review. Journal of Thoracic Disease. 2023; 15: 7077–7087. https://doi.org/10.21037/jtd-23-650

[3] Li Y, Liu K, Yang Y, Zhao T, Guo X, Wang L. Mastery of chest wall reconstruction with a titanium sternum-rib fixation system: a case series. Journal of Thoracic Disease. 2022; 14: 5064–5072. https://doi.org/10.21037/jtd-22-1686

[4] Aramini B, Masciale V, Radaelli LFZ, Sgarzani R, Dominici M, Stella F. The sternum reconstruction: Present and future perspectives. Frontiers in Oncology. 2022; 12: 975603. https://doi.org/10.3389/fonc.2022.975603

[5] Dai Z, Maihemuti M, Sun Y, Jiang R. Resection and reconstruction of huge tumors in the chest wall. Journal of Cardiothoracic Surgery. 2022; 17: 116. https://doi.org/10.1186/s13019-022-01877-9

[6] Hiep ND, Nhat LX, Huy DN, Khang TNT. Radical resection of chest wall tumor followed with sternum reconstruction using titanium bars bridging and skin grafting: two case reports. International Journal of Surgery Case Reports. 2026; 138: 880–886. https://doi.org/10.1097/RC9.0000000000000178

[7] Prisciandaro E, Hustache-Castaing R, Michot A, Jougon J, Thumerel M. Chest wall resection and reconstruction for primary and metastatic sarcomas: an 11-year retrospective cohort study. Interactive Cardiovascular and Thoracic Surgery. 2021; 32: 744–752. https://doi.org/10.1093/icvts/ivab003

[8] de Macedo JPC, Nabuco-de-Araujo PHX, de Campos JRM, Pêgo-Fernandes PM, Terra RM. A new option of reconstruction after extensive chest wall resection. Clinics (Sao Paulo, Brazil). 2025; 80: 100679. https://doi.org/10.1016/j.clinsp.2025.100679

[9] Lampridis S, Minervini F, Scarci M. Management of complications after chest wall resection and reconstruction: a narrative review. Journal of Thoracic Disease. 2024; 16: 737–749. https://doi.org/10.21037/jtd-23-621

[10] Gritsiuta AI, Bracken A, Downs P, Lara-Gutierrez J, Beebe K, Pechetov AA, et al. Surgical management of rare benign tumors of the sternum. MOJ Clinical & Medical Case Reports. 2021; 11: 88–94. https://doi.org/10.15406/mojcr.2021.11.00389

[11] Zhang H, Hou B, Xia T, Ji L, Li J, Chen T, et al. Primary sternal tumour resection and reconstruction with LARS mesh-bone cement sandwich by 3D-printing: Case reports. Frontiers in Bioengineering and Biotechnology. 2023; 11: 1024480. https://doi.org/10.3389/fbioe.2023.1024480

[12] Sponholz S, Baldes N, Schirren M, Oguzhan S, Menke H, Schirren J. Sternal Resection for Breast Cancer Metastases. The Thoracic and Cardiovascular Surgeon. 2018; 66: 164–169. https://doi.org/10.1055/s-0036-1593863

[13] Netscher DT, Izaddoost S, Sandvall B. Complications, pitfalls, and outcomes after chest wall reconstruction. Seminars in Plastic Surgery. 2011; 25: 86–97. https://doi.org/10.1055/s-0031-1275175

© 2026 The Author(s).

