

Huge Chest Wall Tumour Resection and Reconstruction using Titanium Mesh

Mohammad Razi ADLI AZAM¹, Raja Mokhtar RAJA AMIN²

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¹ Cardiovascular and Thoracic Surgery Unit, Surgical Science Cluster, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Jalan Hospital, 47000, Sungai Buloh, Selangor, Malaysia

² Cardiovascular and Thoracic Surgery Unit, Department of Surgery, Faculty of Medicine, University of Malaya, 50603, Kuala Lumpur, Malaysia

Abstract

Malignant chest wall tumour is rare. The presentation is usually aggressive that requires extensive resection to prevent recurrence. However, the extensive resection is to the expense of causing defect on the chest wall and hence, respiratory mechanics. Two cases of chest wall tumour are discussed including the surgical approach of radical tumour resection which was combined with placement of titanium mesh and Transverse Rectus Abdominis Myocutaneous (TRAM) flap to cover the defect and preserve respiratory mechanical functions. The morbidity of using titanium mesh demonstrated in the case series were infection and injury to surrounding tissue due to its rigidity and large size which required its removal. However the formation of 'pseudopleura' made the thoracic cage return back as closed cavity even after the removal of the titanium mesh and allow normal respiratory functions.

Keywords: chest wall, tumour, reconstruction, titanium, mesh

Introduction

Malignant chest wall tumours are rare. Their presentation is usually aggressive, requiring extensive resection to prevent recurrence. However, extensive resection can cause defects in the chest wall and hence respiratory mechanics. The management of two cases of chest wall tumour will be illustrated, including the surgical approach of radical tumour resection combined with placement of titanium mesh and a transverse rectus abdominis myocutaneous (TRAM) flap to cover the defect and preserve respiratory mechanical functions. The outcomes of both cases and subsequent management will also be discussed.

Case report 1

A 75-year-old woman with a history of hypertension and type 2 diabetes mellitus presented with six months of a progressively enlarging left chest wall lump. She had right breast cancer (infiltrating ductal cancer) three years prior and had undergone right mastectomy with axillary dissection, adjuvant chemotherapy, and radiotherapy with subsequent hormonal therapy. More than a year later, she developed a

left breast mass and had a left mastectomy. The tissue biopsy came back as sarcoma. A year later, she presented again with a left chest wall tumour with biopsy-proven liposarcoma, for which wide local excision was performed by an orthopaedic oncologist.

Six months later, she presented with a painful left chest wall lump 4 × 5 cm in size. It was hard, tender, and fixed to the underlying muscle and skin. This patient underwent wide local excision with reconstruction using titanium mesh and a TRAM flap successfully without any immediate post-operative complication.

The histopathology examination reported the lesion as recurrent sarcoma, consistent with myxoid (pleomorphic) sarcoma without margin involvement. Unfortunately, the patient developed serous purulent discharge from the surgical wound two weeks after the surgery. Computed tomogram (CT) scan revealed a chest wall abscess, and culture from the discharge grew *Enterococcus* sp. A 'pigtail' drainage was inserted, and she was started on an antibiotic.

However, after one week in the hospital, she developed excessive bloody drainage, which required emergency exploration. Intraoperatively, it was found that the source of bleeding originated from the intercostal vessel, which was injured by

the titanium mesh. The vessel was then ligated to achieve homeostasis. The titanium mesh was also removed during exploration. A fibrous layer (pseudopleura) covering the defect on the chest wall was observed during exploration.

Case report 2

A 62-year-old man presented with progressive right chest wall swelling six months prior to admission; this swelling was associated with pain and constitutional symptoms (significant loss of weight and appetite) for a month. Clinically, it was a hard right lateral chest wall swelling measuring 15 x 20 cm with a smooth surface and fixed to the underlying muscle.

On contrast-enhanced CT, the thorax and pelvis showed a large, heterogeneously enhanced right antero-lateral chest wall mass with necrotic areas 14.9 (width) × 12.2 (height) cm together with destruction of the 6th and 7th right ribs. It was reported as features suggestive of a neuroendocrine tumour of the right chest wall with liver metastases and right portal vein thrombosis. This patient underwent wide excision of the chest wall tumour en bloc (Figure 1) with the 5th–8th ribs to achieve an adequate margin. The huge defect (Figure 2) was reconstructed using titanium mesh (Figure 3) and a TRAM flap.

Post-operatively, the reconstruction area was complicated with necrotic flap tissue, which required debridement. After a week of daily dressing, the wound was infected with *Pseudomonas aeruginosa*. Therapeutic antibiotic was started together with the removal of the titanium mesh. Again, we observed a fibrotic tissue layer underlying the titanium mesh (pseudopleura).

The histopathological examination of the resected tumour identified it as metastatic clear cell carcinoma that likely originated in the kidney. The patient was then referred to our urology and oncology team, where SUTENT (tyrosine kinase inhibitor) was started.

Discussion

Chest wall tumours can be classified as benign or malignant, primary or secondary and from bone or soft tissue. Most patients present with a painful enlarging mass. Surgical excision is frequently the only modality of treatment (1). Wide resection with tumour-free margins is necessary to minimise local recurrence and maximise the likelihood of long-term survival (2). In very large tumours, a wide resection of the tumour may

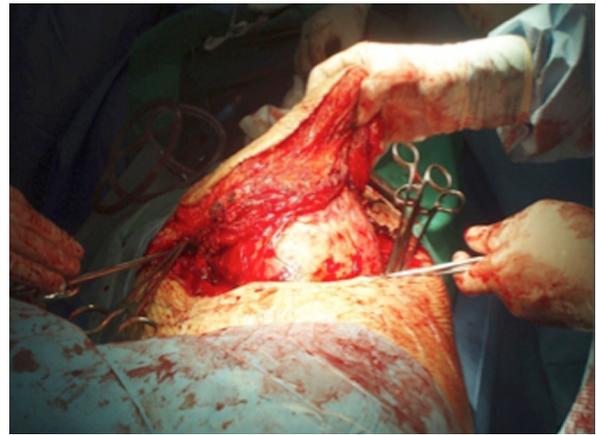


Figure 1: En bloc tumour excision with chest wall.

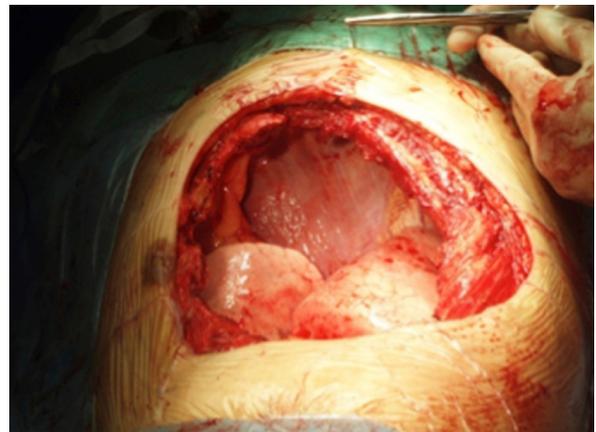


Figure 2: Huge chest wall defect 20 × 20 cm after wide local excision of chest wall tumour.



Figure 3: Titanium mesh placement to cover the defect before Transverse Rectus Abdominis Myocutaneus (TRAM) flap.

be performed, but this will cause a large defect that may compromise respiratory mechanical function. Advances in chest wall reconstruction (muscle transposition) have allowed for more aggressive resection (3).

Literature reviews show that different techniques have been used to cover the chest wall. Cecilia et al. (4), used a titanium rib, Mohsen et al. (5) used a titanium plate with Gore-Tex dual mesh (sternochondral resection), and Chapelier et al. (6), applied Marlex with polytetrafluoroethylene (PTFE) polyglactin meshes. Matsumoto et al. (7) used a titanium plate sandwiched between two polypropylene sheets, and Koto et al. (8), used titanium mesh with a TRAM flap to cover the defect from huge chest wall tumour resection⁸.

In this case series, titanium mesh was used to cover large defects after aggressive resection of a chest wall tumour. The advantages of titanium mesh are its flexibility to conform to the anatomical shape of the chest wall and its provision of a good base for muscle transposition.

Titanium mesh is known as an inert device. However, we observed layers of fibrous tissue in both cases, which was not well documented in previous series. It developed as early as two weeks after placement of the titanium mesh. The layer functioned as a 'pseudopleura', which provided protection for direct entry to the pleural cavity. The reasons behind the formation of these layers are not known. It could have been due to the inflammatory reaction secondary to infection or due to the presence of the titanium mesh itself, which allowed granulation tissue to form. Further study on this issue is needed.

The technical problems encountered with the titanium mesh during surgery were due to its rigidity. It allows limited flexibility during respiration when placed on the thoracic wall. This further compromised the patient's breathing and respiratory mechanics. As illustrated in Case report 1, the rigidity of the titanium mesh caused injury to the surrounding tissue, including blood vessels, in which the intercostal arteries were involved, and subsequently led to significant bleeding.

Due to the large size of the mesh, a large surface area was involved, so the risk of infection was high, as demonstrated in both cases.

Conclusion

In conclusion, we recommend using titanium mesh in large chest wall tumours only in select patients and with specific precautions. This

case report serves to enlighten the emergence of "pseudopleura", which form a closed system thoracic cavity, thereby restoring respiratory mechanics. We hope this report inspires more clinical studies and data collection to further support the practice.

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Conflict of Interest

None.

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Authors' Contributions

Conception and design, analysis and interpretation of the data, drafting of the article, critical revision of the article for the important intellectual content, final approval of the article, provision of study materials or patient, statistical expertise, obtaining of funding, collection and assembly of data: MRAA

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Correspondence

Dr Mohammad Razi Adli Azam
MD (UKM), MS Surgery (Malaya)
Cardiovascular and Thoracic Surgery Unit
Surgical Science Cluster
6th floor, Faculty Of Medicine
Universiti Teknologi MARA
Sungai Buloh Campus
Jalan Hospital, 47000 Sungai Buloh
Selangor, Malaysia
Tel: +603-6126 5333
Fax: +603-6126 5220
Email: dlirazi75@gmail.com

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