

## CASE REPORT

# Non-incisional pleurectomy/decortication for malignant mesothelioma after cardiac surgery

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## Abstract

A 70-year-old man diagnosed with right-sided malignant epithelial pleural mesothelioma, underwent pleurectomy/decortication after three courses of neoadjuvant chemotherapy. He had a history of mitral valve replacement and maze procedure with median sternotomy, and the procedures resulted in strong adhesion from the apex to the mediastinal side. In particular, the peeling of the area where the tumor invaded the pericardium required the most attention; however, the involved pericardium could be partially resected without damaging the right atrium. Finally, en bloc macroscopic complete resection with the entire pleura was successfully performed without conversion to extrapleural pneumonectomy.

## KEYWORDS

cardiac surgery, malignant epithelial pleural mesothelioma, pleurectomy/decortication

## INTRODUCTION

Malignant pleural mesothelioma (MPM) is an extremely aggressive malignant tumor with poor prognosis.<sup>1</sup> Multimodal therapies including surgery, chemotherapy, and radiotherapy have been adopted,<sup>2</sup> and the purpose of surgery is to achieve complete macroscopic resection.<sup>3</sup> Some reports have referred to curative surgical procedures. Recently, a lung-sparing surgical technique is acceptable, and the superiority of pleurectomy/decortication (P/D) compared to extrapleural pneumonectomy (EPP) has been reported.<sup>4</sup> However, the degree of surgical difficulty varies depending on the tumor invasion and adhesion during P/D, and sometimes shifts to EPP are necessary.

We report the first case of a patient who underwent successful P/D for MPM with a history of cardiac surgery using median sternotomy.

## CASE REPORT

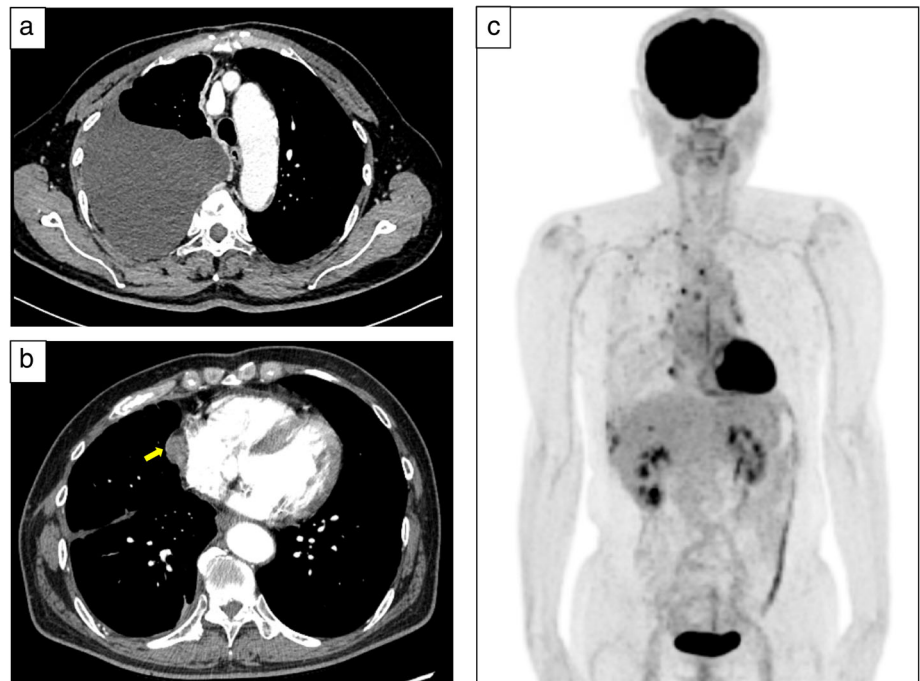
A 70-year-old man underwent mitral valve replacement and a maze procedure for atrial fibrillation with median sternotomy

2 years, previously. The follow-up chest X-ray scan showed a gradual increase in right pleural effusion, and he was referred to our hospital. Chest computed tomography (CT) revealed right pleural effusion and pleural thickening (Figure 1(a)). He underwent right pleural biopsy by video-assisted thoracic surgery (VATS) and was diagnosed with epithelial malignant pleural mesothelioma. A positron emission tomography (PET) CT showed no lymph node or distant metastases, and the stage of MPM was c-T3N0M0 Stage IB according to the International Association for the Study of Lung Cancer (IASLC) 8th edition.

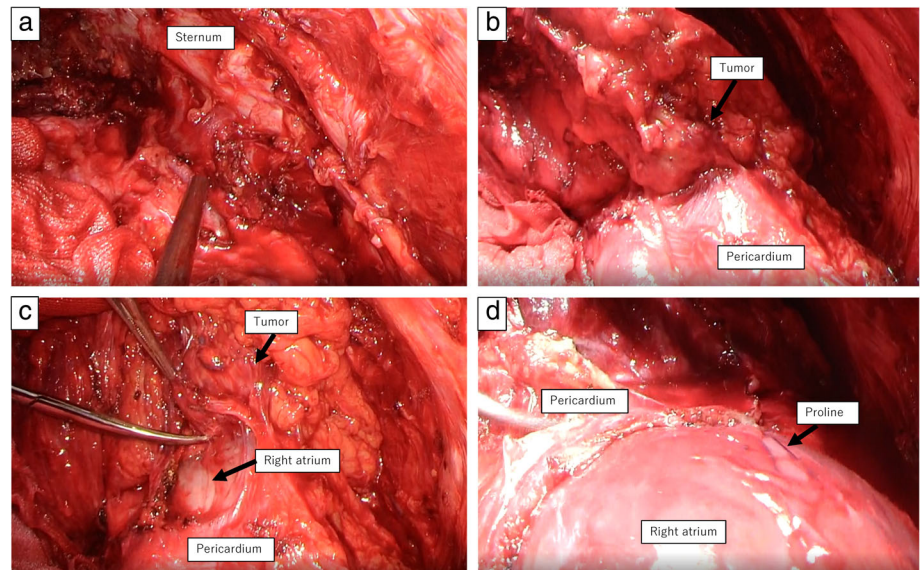
The patient received three courses of cisplatin plus pemetrexed neo-adjuvant chemotherapy. The chest CT after the chemotherapy showed a tumor measuring 2 × 2 cm, making contact with the right atrium, and invasion could not be ruled out (Figure 1(b)). The PET-CT showed no lymph node or distant metastases, and the patient was diagnosed with stable disease (SD) (Figure 1(c)). He underwent P/D as a curative surgery.

Strong adhesions on the mediastinal side were considered because of the previous cardiac surgery via median sternotomy. An extracorporeal circulation was placed on standby in

**FIGURE 1** Chest computed tomography (CT) and positron emission tomography (PET)-CT of the patient. (a) Right pleural effusion and pleural thickening on initial examination. (b) Chest CT after neoadjuvant chemotherapy. The tumor ( $2 \times 2$  cm) was in contact with the right atrium (arrow), and invasion was not ruled out. (c) PET-CT after neoadjuvant chemotherapy showed no lymph node or distant metastases, and the patient was diagnosed with stable disease (SD)



**FIGURE 2** Surgical findings. (a) There was strong adhesion from the apex to the mediastinal side due to the previous cardiac surgery. (b),(c) Shows the tumor invasion to the pericardium. The pericardium was carefully opened; however, the pericardium and right atrium were strongly adherent. (d) Prolene from the past cardiac surgery could be observed



preparation for massive bleeding, especially in case of right atrial rupture.

As advocated by Hasegawa et al.<sup>5</sup> we performed the P/D technique without any pleural incision (“non-incisional P/D”), to achieve en bloc removal of the entire pleura.

First, a posterolateral incision was made, and we performed a P/D seventh costal bed thoracotomy. Second, extrapleural dissection was initiated using the fingers. There was strong adhesion from the apex to the mediastinal side, especially to the back of the sternum because of the previous cardiac surgery, and careful peeling was required (Figure 2(a)). The chest CT confirmed that the tumor was in contact with

the pericardium and direct invasion to the pericardium was suspected (Figure 2(b)). The pericardium was opened carefully. The pericardium and right atrium were strongly adherent; however, there was no direct invasion (Figure 2(c)). There was no pericardial effusion, and polypropylene thread (Prolene, Ethicon) from the past cardiac surgery could be observed (Figure 2(d)). The peeling proceeded gradually, and finally, the involved pericardium was partially resected without damaging the right atrium. Peeling of the visceral pleura was then performed. Finally, en bloc macroscopic complete resection of the entire pleura was performed.

The total blood loss was 5300 mL, and the operation time was 688 minutes. The air leak stopped 3 days after the surgery, and he was discharged 17 days after the surgery.

## DISCUSSION

To our knowledge, this is the first case report of a patient with MPM who underwent successful P/D after cardiac surgery with median sternotomy. The highlights of this surgery are as follows: (1) the adhesion from the apex to the mediastinal side was strong, particularly at the back of the sternum; however, peeling was possible and en bloc macroscopic complete resection with the entire pleura could be completed without conversion to EPP; and (2) it is possible to peel off the tumor in contact with the pericardium and right atrium.

Formation of intrapericardial adhesions after median sternotomy is a widely known phenomenon.<sup>6</sup> In this case, strong intrapericardial and mediastinal adhesions were anticipated, especially on the right side, because the patient had undergone a maze procedure in addition to mitral valve replacement via median sternotomy. The conversion to EPP might be considered if peeling of the pleura was impossible. Reports on the superiority of P/D, including low morbidity and mortality in terms of preservation of pulmonary function, have been increasing in recent years.<sup>4,7,8</sup> It was noteworthy that the P/D was successfully completed without conversion to EPP.

Here, the preoperative chest CT scan revealed that the tumor contacts the right atrium and invasion to the pericardium or right atrium could not be ruled out. If the right atrium had ruptured during the peeling, there was possibility of massive bleeding; therefore, an extracorporeal circulation was put on standby. Fortunately, adhesion between the pericardium and right atrium was detachable, and there was no direct invasion of the tumor into the right atrium. We recommend sufficient preparation for emergent bleeding, such as having an artificial heart-lung machine on standby when operating on similar cases.

In summary, the following scenarios may have occurred in this case: (1) the massive bleeding by rupture of right atrium; and (2) the conversion to the EPP. As a countermeasure, extracorporeal circulation was put on standby. We had confirmed that conversion from P/D to EPP might be possible in the point of preoperative respiratory function and cardiac function. Fortunately, these scenarios had not occurred in this case; however, it is important to be well prepared for each scenario.

In conclusion, we successfully treated a patient with MPM who underwent P/D after cardiac surgery with

median sternotomy. Although the adhesions from the apex to the mediastinum and pericardium were strong, en bloc resection could be completed without conversion to EPP by careful peeling.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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