Surgical treatment for severely damaged lung and pyothorax with bronchopleural fistula 9 years after induction chemoradiotherapy and bilobectomy

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Abstract

Here, we present a 54-year old man 9 years after induction chemoradiotherapy and subsequent lower bilobectomy for Stage IIIA lung cancer suffering late complications of pyothorax and bronchopleural fistula in a severely damaged lung. Open-window thoracostomy and subsequent completion pneumonectomy via median sternotomy and anterior thoracotomy were performed. Although sternal wound infection required steel wire removal and debridement, with wound dressing at home, the patient could return to work. Late complications from infected treatment-damaged lungs need to be taken into consideration after induction chemoradiotherapy and subsequent surgery.

Keywords: Induction chemoradiotherapy • Lung cancer • Severely damaged lung • Open-window thoracostomy • Completion pneumonectomy

INTRODUCTION

Fibrobullous changes resulting in lung destruction have been described after aggressive chemoradiotherapy or lobectomy in lung cancer patients [1]. Here, we report a patient with infection of a severely damaged lung 9 years after induction therapy for Stage IIIA lung cancer, which required complex surgical treatment.

CASE PRESENTATION

A 54-year old man presented with persistent cough and fever. He had had induction chemoradiotherapy and subsequent surgery for squamous cell carcinoma in the right lower lobe 9 years previously. The tumour was 5 cm in size with subcarinal lymph node metastasis, confirmed by thoracoscopic biopsy (cT2bN2M0, Stage IIIA). He underwent induction chemoradiotherapy with two cycles of docetaxel and carboplatin and concurrent irradiation at 40 Gy, resulting in partial response; this was followed by lower bilobectomy with mediastinal lymph node dissection. The pathological response was moderate (ypT2bN2M0, Stage IIIA), and adjuvant chemotherapy with docetaxel and carboplatin followed by oral tegafur-uracil for 2 years was administered. Chest computed tomography, performed as routine follow-up, showed clearly demarked radiation fibrosis at the mediastinal side of the right upper lobe 1 year after surgery (Fig. 1a). Progressive fibrous changes in the rest of the right upper lobe had appeared 2 years after surgery, gradually expanding from the site of radiation fibrosis, and resulting in severe lung damage 4 years after surgery (Fig. 1b–d). However, except for a slight dry cough, he had no complaints.

His fever persisted for 4 weeks despite oral antibiotic administration (clarithromycin and levofloxacin). Microbiological examination revealed Streptococcus pneumoniae in his sputum. On the day of admission, he complained of increasing serous sputum, and chest X-ray revealed a pyopneumothorax, suggesting bronchopleural fistula (Fig. 2a). He underwent open-window thoracostomy, with 5-day administration of doripenem. Even after open-window thoracostomy, he continued to suffer persistent fever and underwent completion pneumonectomy 6 weeks later. Despite a risk of sternal wound infection, the hemiclamshell incision (median sternotomy and anterior thoracotomy) was selected as a safer surgical procedure for hilar dissection. The right main bronchial stump was covered by a thythic fat pad. The strong dense covering on the pyothoracic cavity was curetted as much as possible. Sulbactam/ampicillin was administered for 8 days, and then tazobactam/piperacillin for 5 days.

On the third postoperative day, a small bronchopleural fistula developed and left sub-pleural emphysema occurred (Fig. 2b). These resolved spontaneously over several days. Initially, the post-sternal space was well drained (Fig. 2b), but became packed with the ascending aorta as the thoracic cavity rapidly shrank in size (Fig. 2c) resulting in sternal wound infection. Steel wire removal and surgical debridement were performed 5 weeks after completion pneumonectomy (Fig. 2d), with 4-day administration of ceftazidime. Although transient sternoclavicular joint
inflammation occurred, he was discharged 9 weeks after com-
pletion pneumonectomy. The patient returned to work, with his
family changing the gauze dressing at home on both the sternot-
omy and the open-window wounds. The sternal wound was
epithelialized 14 weeks after removing the wire. Thoracoplasty is
scheduled for around 1 year later.

DISCUSSION

Operative morbidity and mortality after chemoradiation induction
therapy still remain a great concern [2]. In the present case,
progressive fibrous changes had spread gradually from the medi-
astinal portion with radiation fibrosis to the residual upper lobe,
suggesting a late complication after chemoradiation induction
therapy. Whereas out-of-field radiation pneumonitis has been
reported in severe radiation pneumonitis or in bronchiolitis oblit-
erans organizing pneumonia syndrome in patients with breast
cancer [3], which typically occurs bilaterally, late-onset progressive
fibrosis cannot be considered merely an irradiation complication.
The residual upper lobe showed severe inflammation, without any
findings of mycobacterium or Aspergillus infection.

Late fibrobulous changes of residual lobes after lobectomy in lung cancer patients have been reported, even without che-
moradiotherapy [1]. This developed an average of 2.5 years after
lobectomy. Compensatory over-inflation of the residual lobes is
thought to be the cause. Bronchial deformity and destruction of
lymphatic canals, and branches from the vagal nerve and
bronchial artery during lymph node dissection might affect
chronic respiratory tract inflammation and accelerate fibrobul-
loous changes. Radiation injury should be an additional risk for
this pathogenic process, resulting in the progressive fibrous
changes in the present case.

We have conducted a clinical trial of induction therapy start-
ing in 2001 [4]. Among 30 patients enrolled, 9 survived recur-
rence free for >5 years. Most had radiation fibrosis only to a
limited extent, and progressive fibrous changes were seen only
in the patient presented here. Although rare, one should be
aware of late-onset progressive fibrous changes as a late compli-
cation after chemoradiation induction therapy requiring complex
surgical treatment.

Surgical treatment for late-onset pyothorax and bronchopleural fistula in the damaged lung occurring after induction
therapy was thought to be technically difficult, with high mor-
bidity due to scarring after radiation and surgical resection, and
due to the extremely dense pyothoracic wall covering the hilum.
Whereas salvage lung resection after definitive radiotherapy has
been reported to be feasible, a longer interval between radiation
and resection increases the risk, because the fibrotic response to
radiation-induced injury matures over time [5]. Surgical indica-
tion for completion pneumonectomy was contemplated at first
presentation with persistent fever, but the technical difficulty
and expected morbidity made us hesitate, resulting in a delay of
2 months.

Despite the risk of sternal wound infection with uncontrolled
pyothorax, a trans-sternal trans-pericardial approach was
thought to be safer for hilar dissection. Although rapid shrinking of the thorax resulting in the restriction of the retrosternal space and subsequent sternal wound infection occurred, steel wire removal and debridement were effective.

Conflict of interest: none declared.

REFERENCES


