was my decision to attempt pleural tent creation using an ECM patch, with potential muscle flap advancement if that approach would have proven unsuccessful.

The choice of ECM as a pleural substitute was considered a way to avoid a nonbiologic patch because of risk of infection in the setting of a persistent air leak. The CorMatrix ECM formulation is approved for pericardial repair and was a reasonable choice in comparison with other biologic materials such as Alloderm Tissue Matrix (LifeCell, Bridgewater, NJ) because of its approved indication and lower cost (approximately $1,000 versus >$15,000 for Alloderm). Extracellular matrix may have advantages in infected surgical fields, and it has remained free of calcification for longer-term implants, perhaps owing to the material being replaced by the patient’s own tissues [7, 8]. Rather than restricting or “fixing” the size of the apical left chest, the ECM tent allowed for the normal growth and development of the remaining ipsilateral lung segments over the next year.

Extracellular matrix was an effective substitute for the native pleura in the process of creating a pleura-like tent to control a persistent air leak and apical pneumothorax in a 21-month-old child after resection of a complex airway malformation with concomitant dextrocardia and pectus excavatum. Over the first year, the ECM apical tent allowed for the normal growth and development of the remaining ipsilateral lung segments. The use of ECM as a pleural substitute may also be a reasonable alternative when a pleural tent cannot be created because of the destruction of the apical pleura by tumor or when the dissection of dense apical adhesions compromises the integrity of the apical pleura.
margins. The patient returned to normal life with minimum loss of pulmonary reserve and no recurrence of lung cancer for 6 months.

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Pneumonectomy has high morbidity and mortality despite recent advances. Therefore, it should be carefully performed in patients with poor pulmonary reserve or other lesions in the contralateral lung. Bronchial and pulmonary arterial sleeve resections for locally advanced central lung cancer are widely done [1]. However, reconstructing bronchovascular structures is difficult in patients with widespread lesions. Lung autotransplantation after pneumonectomy using a solution for lung preservation allows healthy lung tissue only to be autotransplanted after pneumonectomy. In this procedure, cold preservation and resection of malignant lesions follows pneumonectomy.

Even in advanced cases, performing cancer resection is safe and definitive because of the advantage of the ex vivo operation. Reconstructing bronchovascular structures is also feasible by switching the lower pulmonary vein (PV) to the upper PV, even for patients in whom bronchovascular sleeve resection is too complicated due to cancer extension. Further, allograft rejection cannot occur with autotransplantation. Ischemia–reperfusion injury is considered less likely to occur using cold lung preservation solution than warm ischemia.

A 44-year-old man with locally advanced central lung adenocarcinoma (cT4 N1 M0) was admitted to our hospital. He had been aware of facial swelling for 3 months. Chest computed tomography (CT) showed a tumor involving the superior vena cava (SVC), right main pulmonary artery (PA), and main bronchus (Fig 1). His predicted postpneumonectomy forced expiratory volume in 1.0 second (FEV1) was 1,520.3 mL (40.8%), which was considered unsafely low. Moreover, he had a large bulla in the left upper lobe. A double-sleeve resection of the right upper and middle lobes was considered to be too difficult because of the gap between the proximal and distal bronchovascular structures. Bridging would have been very difficult due to a tethering effect caused by the intact inferior PV.

We suggested the option of induction chemotherapy and radiotherapy, but the patient rejected the suggestion and insisted on an operation because he was very afraid of SVC syndrome progression. Therefore, the patient was scheduled to undergo a right lower lobe autotransplantation after pneumonectomy. This procedure was approved by the Kagoshima University Hospital Institutional Review Board.

A median sternotomy and a right fourth intercostal anterolateral thoracotomy were performed. In addition, a laparotomy for omentopexy on the bronchial anastomosis was performed. Heparin sodium (1 mg/kg) was administered intravenously for systemic heparinization after dissection of the mediastinal and hilar lymph nodes. An innominate vein-to-right atrial bypass with a polytetrafluoroethylene graft was performed. The PA and PV were clamped, and pneumonectomy with combined resection of the SVC was done (Figs 2A and 2B). The upper PV was resected as distally as possible, and the lower PV was resected as proximally as possible for anastomosis.

On an ex vivo table, the main bronchus was intubated and ventilated with room air. Antegrade and retrograde pulmonary vascular perfusions were both performed with an extracellular phosphate-buffered solution (2,000 mL) for lung preservation. The ex vivo resection of the lower lobe and trimming of the graft for autotransplantation were safely performed (Fig 2C). Bronchial and vascular surgical margins were confirmed cancer-free by intraoperative frozen section.

During the in vivo procedure, the lower bronchus of the graft was anastomosed to the main bronchus. Then, the lower PV of the graft was anastomosed to the remaining upper pulmonary venous stump. Finally, the PA was reconstructed using a tube created by autologous pericardium fixed by glutaraldehyde (Fig 2D). The total ischemic and operation times were 249 minutes and 799 minutes, respectively.

The patient’s postoperative course was uneventful, and ischemia–reperfusion injury was not observed. The patient was discharged from the intensive care unit 8 days after the operation. The FEV1 values before and after the operation were 2,300 mL (61.8%) and 2,130 mL (57.4%), respectively.

The final histological diagnosis was pT4 N0 M0 adenocarcinoma. The patient received postoperative adjuvant chemotherapy with vinorelbine and cisplatin. He returned to normal life, with a minimum loss of pulmonary reserve and no recurrence of lung cancer for 6 months (Fig 3).

Comment

Pneumonectomy causes a large loss of pulmonary reserve and still has high morbidity and mortality. The indication...
for bronchial and pulmonary arterial sleeve resections for locally advanced central lung cancer is well established [1]. However, reconstructing bronchovascular structures in patients with widespread lesions is complicated. There are a few reports of autotransplantation without cold lung preservation but with systemic heparinization [2, 3]. Previous reports showed the ability of a lung preservation solution to prevent ischemia–reperfusion injury in the lung graft. Oto and colleagues [4] reported using a solution for lung preservation in case of basal segmental autotransplantation.

Autotransplantation might be thought of as complicated and expensive, but there is no need to purchase anything except a lung preservation solution. In our patient, an extracellular phosphate-buffered solution was used for lung preservation. Clinical application of the solution has been established in preliminary results of a Japanese series [5], and the solution is commercially available (EP-TU solution; Cell Science & Technology Institute, Sendai, Japan). Significant ischemia–reperfusion injury did not occur in our patient.

A direct anastomosis of the PA was too difficult in our patient because the right PA was resected 10 mm distal to the main PA. Reconstruction of the PA with an autologous pericardial tube graft has been reported previously [6]. The pericardium was fixed by glutaraldehyde solution to prevent long-term shrinkage and formed into a tube that was adjusted to the anastomosis size. Postoperative enhanced computed tomography of the chest showed no PA stenosis.

This procedure has several advantages. Firstly, the ex vivo operation achieved a safe and definitive cancer resection, even in an advanced case. Secondly, cold lung preservation reduced ischemia–reperfusion injury risk and allowed enough time to confirm histologically negative margins.

In conclusion, it was possible to perform autotransplantation with detailed planning and preparation. By using a lung preservation solution, well-trained general thoracic surgeons can safely perform this procedure.

Fig 2. (A, B) Pneumonectomy with combined resection of the superior vena cava (SVC) was done after an innominate vein–right atrial bypass was performed. (C) The ex situ resection of the right lower lobe (RLL) and trimming of the graft for autotransplantation were performed after lung preservation. (D) First, the lower bronchus of the graft was anastomosed to the main bronchus, and then the lower pulmonary vein of the graft was anastomosed to the remaining upper pulmonary venous stump. Finally, the pulmonary artery (PA) was anastomosed by the intermediary of autologous pericardial tube. (IPV = inferior pulmonary vein; LLL = left lower lobe; LUL = left upper lobe; RUL = right upper lobe; SPV = superior pulmonary vein.)

Fig 3. Postoperative chest roentgenogram shows a well-expanded autograft.
Diffuse Lipomatosis of the Chest Wall: Report of a Neonatal Case
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Diffuse lipomatosis is a very rare condition, the nature of which, neoplastic or hamartomatous, has not yet been defined. We report the case of a small child with a right thoracic lesion of neonatal onset and extremely rapid growth, who successfully underwent complete surgical resection. The differential diagnoses and proper surgical treatment are discussed.


Lipomatosis is a rare condition consisting of diffuse, nonlocalized overgrowth of adipose tissue [1-3]; various forms are nosologically distinguished, differentiated by anatomic location, with overlapping features. Most lipomatoses affect middle-aged patients; multiple symmetric lipomatosis (Madelung disease or Launois-Bensaude syndrome), mediastinal-abdominal lipomatosis, steroid lipomatosis, and adiposis dolorosa (Dercum disease).

In the pediatric age, the most frequently reported form is congenital infiltrating lipomatosis of the face, in which the adipose proliferation is accompanied by proliferation of fibrovascular tissue and nerves [4]. The Bannayan-Zonana syndrome (lipomatosis, angiomatosis, and macroencephaly) is a congenital hamartomatous disorder with autosomal dominant inheritance and variable expression. Lipomatosis of nerve can present at birth or in early childhood and is frequently associated with macrodactyly.

Diffuse lipomatosis (DL) usually occurs in patients under 2 years of age but may also occur in adolescents and adults. It usually affects the trunk or a limb, but also the head and neck. The adipose overgrowth involves subcutaneous tissue and muscle but not nerves. The DL tends to recur, often repeatedly over many years [5–7]. It may attain a large size, thus causing compression of vital structures or impaired function. Because of its rapid growth and large size, it can clinically simulate liposarcoma. On histologic grounds, the lesion, which lacks a true capsule and can infiltrate striated muscles, is composed entirely of mature fat. No lipoblasts are detected, nor have cytologic abnormalities, pleomorphism, or atypia been reported. No specific karyotypic aberration has so far been described in DL.

A 1-month-old girl was referred to our institution for an upper right thoracic mass, which had recently been noted by her parents. The patient was in good clinical condition, showing no respiratory distress or other symptoms. Family and personal histories were unremarkable. Prenatal ultrasound imaging was negative. Ultrasound scan showed a solid mass in the right hemithorax with echogenicity similar to that of subcutaneous fat. Follow-up ultrasound scans revealed very rapid enlargement of the mass. At 3 months of age, magnetic resonance imaging showed a large mass (7.8 × 8.2 × 3.6 cm) in the right hemithorax, infiltrating the pectoralis muscles and in contact with the right mammary gland and the axillary vessels. On T1-weighted images, signal intensity was the same as that of subcutaneous fat (Fig 1), while on T2-weighted fat-suppressed images the signal was hypointense. These findings were typical of fat content, the extremely rapid growth of the lesion was of particular concern and prompted a tru-cut biopsy approach in order to rule out malignancy.

The biopsy was carried out with a 16G needle and produced 5 core biopsies; a part of the tissue was used for cytogenetic analysis. The histologic picture, identical in all of the biopsies, consisted entirely of mature fat. No lipoblasts or signs of malignancy of any histotype were found. This was in keeping with the cytogenetic analysis, which revealed no particular aberrations. Nevertheless, given the mostly subcutaneous site of the mass, a sampling error could not be ruled out.

As the mass continued to grow extremely rapidly, with progressive infiltration of the mammary gland, an attempt at complete removal was undertaken (Fig 2). The surgical approach involved an S-incision; the mass showed adhesions to the muscular fascia and infiltration...