FEATURE ARTICLES

A right upper lobectomy via standard lateral thoracotomy.

we suspected that the tumor was malignant and planned branches of the right pulmonary artery to the right upper
case of partial resection and reconstruction of the SVC, using
approach, or a posterolateral thoracotomy. We present a
chosen, such as a median sternotomy, the hemi-clamshell
material. In each case, an optimal surgical procedure is
complete resections of the SVC are replaced with prosthetic
are repaired with direct sutures or a patch, whereas com-
vascular shunt between the point of entry of the left
innominate vein into the SVC and the right atrial
appendage, using an Anthron VTT-51160 (Toray In-
dustries, Chiba, Japan) antithrombogenic bypass tube.
The tube was secured at each site of venous insertion,
using monofilament, nonabsorbable polypropylene purse
string sutures, straddling the tumor (Fig 1). We clamped
the SVC on either side of the tumor before resecting it
together with approximately 60% of the SVC wall
circumference. A patch of autologous pericardium was
excised and fixed in glutaraldehyde for 15 min. The SVC
duct was reconstructed with this pericardial patch,
using a continuous monofilament, nonabsorbable poly-
propylene suture, while the patient’s circulation was
maintained by the flow across the shunt during intrave-
nous anticoagulation with a total of 3000 units of heparin.
After reconstruction of the SVC, we removed the shunt
tube and tightened the purse string sutures. The SVC was
clamped for 38 min, the overall operation lasted 444 min,
and the total blood loss was 807 mL.

The pathologic diagnosis of the tumor was pulmonary
metastasis of the femoral adamantinoma. The patient’s
postoperative course was uneventful, and she was dis-
charged on day 15 without postoperative anticoagulation.

Comment

Invasion of the SVC by a lung neoplasm has often been
considered inoperable. However, selected cases have
been reported on the feasibility and success of extended
surgery, including resection of the SVC. Spaggiari and
colleagues [1] reported a 49%, 25%, and 21% probability
of 1-, 3-, and 5-year survival, respectively, after resection
of SVC invaded with non-small-cell lung cancers. The
extent of the resection depends on the degree of tumor
involvement, its location, and the means of vascular

Advanced central lung cancers can invade the superior
vena cava (SVC). Although the indications for resection
of the vessel remain controversial, it has been suggested
that it increases the long-term survival of selected pa-
tients; however, little consensus has been reached
regarding the optimal method of vascular reconstruction.
While the SVC is often replaced during unprotected
cross-clamp, the placement of a temporary venous shunt

When invaded by lung cancer, the superior vena cava
(SVC) is often resected during a radical operation.
Several reconstructive techniques have been described for
these major vessels, although little consensus has been
reached thus far. In the majority of cases, partial resections
are repaired with direct sutures or a patch, whereas com-
plete resections of the SVC are replaced with prosthetic
material. In each case, an optimal surgical procedure is
chosen, such as a median sternotomy, the hemi-clamshell
approach, or a posterolateral thoracotomy. We present a
case of partial resection and reconstruction of the SVC, using
an autologous pericardial patch with a temporary venous shunt,
via a standard lateral thoracotomy.

Technique

An asymptomatic, 74-year-old woman was referred to our
medical center for evaluation and treatment of a nodule,
17 mm in its widest diameter, detected in the right upper
pulmonary lobe by an annual, screening positron emis-
tion–computed tomography. She underwent total
clamshell thoracotomy and bronchoscopic resection of a
tumor, 17 mm in its widest diameter, in the right upper
divisional bronchus. The right upper lobe was
excised and

with a view to preserve the periprocedural safety and
facilitate the postoperative management seems preferable.
We describe an SVC reconstruction procedure using
an autologous pericardial patch and placement of a tem-
porary extravascular shunt via a lateral thoracotomy.

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http://dx.doi.org/10.1016/j.athoracsur.2014.06.078

© 2014 by The Society of Thoracic Surgeons
Published by Elsevier

Accepted for publication June 11, 2014.
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reconstruction [2]. The SVC is usually reconstructed, using a simple running suture or patch when the tumoral infiltration is less than 50% of the original venous circumference. When greater than 50% of the circumference is invaded, a prosthetic replacement, such as a polytetrafluoroethylene graft, may be needed to completely excise the tumor [3]. When the invasion is limited and a patch is feasible, autologous pericardium is recommended instead of a prosthetic device, because the pericardium offers the appropriate thickness and strength, is free, and is widely available. The risks of infection and thrombosis are low, and postoperative anticoagulation is not needed [4, 5]. Because pericardium preserved in glutaraldehyde does not shrink or curl, it is easily sutured to the vascular wall [5]. Regarding to the surgical approach, a median sternotomy or hemi-clamshell seems preferable to expose and reconstruct the SVC, whereas a lateral thoracotomy is preferred for lobectomies or pneumonectomies [1]. For partial SVC resections without anastomosis of the left innominate vein, a lateral thoracotomy can be performed safely [2].

When reconstructing the SVC, many operators use a cross-clamp technique without temporary venous shunt. Total occlusion of the SVC causes major hemodynamic disturbances in the head, neck, and cerebral venous system, particularly in patients with partial obstruction of the SVC. Clamping the SVC increases the cerebral venous pressure and lowers the arterial-venous gradient, with a high risk of irreversible cerebral edema and venous thrombosis [3–5]. It can also decrease the ventricular preload and cardiac output and cause systemic hypotension. Because patients with lung neoplasms who undergo SVC resection do not usually suffer from chronic SVC syndrome, the effects of clamping are instantaneous [6]. Although it has been suggested that neurologic complications can be prevented by clamping the SVC for less than 45 min, there is no consensus regarding the time of onset of cerebral edema and risk of irreversible brain damage [7]. The use of a temporary extravascular shunt in most if not all SVC resections is likely to prevent these complications.

In conclusion, we have described a safe partial resection of the SVC and its reconstruction via a lateral thoracotomy, using an autologous pericardial patch to prevent the complications associated with prosthetic replacement and long-term anticoagulation. Furthermore, the placement of a temporary extravascular shunt enabled us to operate during stable hemodynamic function and without being pressed for time.

We thank Yuichiro Hayashi, MD, and Katsura Emoto, MD, at the Department of pathology in Keio University Hospital, for their work in the pathologic diagnosis of the resected lung tumor.

References