Acta Med. Nagasaki 39:157–159

En Bloc Resection for Lung Cancer Involving Left Atrium

Masao TOMITA, Akihiro NAKAMURA, Masaaki JIBIKI, Fumitaka AKAMA, Tetsuya UCHIKAWA, Nabuhumi SASAKI, Hiroshi SINGUU, Kazuhiko HATANO, Yoshihiro MATSUMOTO, Masashi MURAOKA, Shinya YAMAGUCHI, Seiichiro IDE, Atsushi NANASHIMA, Yoshitaka TANIGUCHI, Naoki FUJISE

The First Department of Surgery, Nagasaki University School of Medicine

En bloc resections for patients with left atrium involved by lung cancers were evaluated in the 8 patients in terms of the operative procedure, the indication and the outcome. In one patient, application of extracorporeal circulation was accomplished to perform a complete resection and also to permit patch plasty to compensate volume diminution. En bloc resection on extracorporeal circulation is recommended for patients with limited cancer extension of squamous cell carcinomas without nodal involvement.

In addition, emphasis has been placed in the genesis of double cancer in follow-up study according to improvement of surgical result in reflection of susceptibility to carcinomas in other organs.

Introduction

For the purpose of obtaining more improved surgical result, attention has been paid to aggressive surgery for advanced lung cancer patients involving the mediastinal organs.

Recently perioperative circulatory supportive device has been advanced with practical ease and safty. As a result, surgical approaches to the heart and the great vassuls are prevalent in clinical use.

Involvement of the wall of the left atrium is one of the targeting lesions of the surgical indications. In the case of left atrial involvement, there are two cases of direct cancer invasion through the wall of the pulmonary vein and of polypoid lesion protruding and accupying the left atrial cavity.

Patients

Eight patients underwent partial resection of the left atrial wall, who included patch closure for a defect of the atrial wall in one. The patients' ages ranged from 61 to 69. Main chief complaints were respiratory distress such as sputum and hemoptysis. No symptom was only in one. Primary lung cancers were situated in right lower lobes of which four were in the segments of the lower lobes, S^6 and S^{10} in each two, respectively. Histlogical types were squamous cell carcinomas in all eight patients. According to TNM factor, T_3 were in 4 and T_4 in 4, n_0 in 7 and n_2 in 1, M_0 in 8, respectively.

Preoperatively sonographic findings were unclear in the border between of the left atrial walls and the left pulmonaly veins. In one, polypoid mass within the left atrial cavity was clearly defined by preoperative sonography as well as angiography. On the other hand, preoperative angiography revealed the finding of obstruction and interruption of the inferior pulmonary veins. The operative procedures were pneumonectomy in 4, lobectomy in 2 and bilobectomy in 2, respectively.

At resection of the left atrial wall, a Satinsky clamp was used for holding the resected margin of the atrial wall. No patient sustained hemodynamic changes during a clamping period except for temparary appearance of supraventricular arrythmia. In the case of applying clamp method, left atrial wall was resected at maximum 3 cm apart from the attachment of the pulmonary vein. In older patients, it was common that the left atrium was distended with fragile wall tissue that gentle handling of clamping was essential for ensuring surgical security.

One patient with polypoid tumor in the cavity of the left atrium underwent patch repair for defect after resection of the left atrial wall under the aid of extracorporeal circulation. When reduced one-third of left atrial cavacity, patch repair is recommended to maintain stroke volume. The surgical outcome was related to how to prevent occurring local recurrence and distant metastasis. Local recurrences occurred from 3 months after surgery. On the other hand, hematogenous metastases to the bone and the brain were seen 8 to 11 months following surgery. The other causes of deaths were in association with respiratory failure dur to pulmonary dysfuction and pneumonia.

One patient who underwent resection of polypoid lesion with an aid of extracorporeal circulation survived one year and 7 months with subsequent resection of rectal cancer termed so-called double cancer at the 9th month after the initial operation. This patient showed the significance of the surgical treatment for T_4 lung cancer with the use of extracorporeal circulation, suggesting that T_4 lung cancer involving the left atrium be a good candidate for surgery

Patient profile

age	sex	symptome	primary site	histology	TNM	sonography	angio	op. method	left atrium	resection margin	complication	outcome
62	F	bloody sputum	RLL	sq	T3NOMO	−	no filling of l-PV	pneuminectomy	partial	1.5cm	(−)	3M local reccurence
63	M	bloody sputum	S6	sq	T3N1MO	−	filling PV	ML-Bilobect bronchoplasty	partial	1.0cm	(−)	13 M brain meta
60	M	dyspnea	LLL	sq	T3N1MO	no finding	finding (+)	l-pneumo	partial	1.0cm	(−)	11M unknown
61	M	(-)	IS6	sq	T3NOMO	no tumoeous echo	no-filling of PV	l-pneumo	partial	3.0cm	(−)	24M pneumonia
61	M	weightloss	7S10	sq	T3NOMO	no detectable	(−)	RLLobectomy bronchoplasty	partial	1.5cm	anastomosis insect	13M local recurrence
66	M	cough	IS10	sq	T4NOM	−	−	LLLobectomy bronchoplasty	partial	2.0cm	intraop. cardia arrest	8M bone meta
61	M	cough	LLL	sq	T3N2MO	no defined margin of left atrium	obstrection of PV	l-pneumonectomy	TA-50	2.0cm		4M dyspnea
59	M	bloody	LLL	sq	T3NOMO	polypoid tumor	filling	RML-bilobectomy patch of left (extracorporeal circulation)	partial	3.0cm	(−)	24M alive 7M rectal cancer op.

with good selection.

Discussion

Recent advances in surgery have made it possible to extend the indication of the surgiral treatment for T_4 lung cancer including the left atrium involvement.

In such a case, the use of extracorporeal circulation was mandated except for application of a Satinsky clamp.

Application of extracorporeal circulation consists in the cases of 1) extensive invasion on the wall of the left atrium which is impossible to apply the hemostatic clamp and 2) high risk of shower embolism by fragmentation of polypoid carcinoma tissues by handing of hemostatic clamp.

Needless to say, the advantages of the use of extracorporeal circulation were 1) ensurement of bloodless operative field without clamping maneuvor, 2) prevention from fragmentation of polypoid tumors, 3) reduction of bloodless state until recirculation of bled blood. The drawback of the use of extracorporeal circulation is 1) a risk of bleeding diathesis in various organs due to hemolysis, 2) volume overloading by diluted blood circulation, 3) dissemination of tumor cells mixed with circulating blood.

The major item is dissemination of tumor cells by recirculation into the circuit when the tumor mass is exposed into the blood stream. Ensurement of the left atrium is limited to a 35 to 40 % resection of left atrial cavity. And also it is assumed that a resection of the left atrial wall should be limited within 6 cm long.

However, patch plasty for the defect of left atrial wall after resection serves to exert in compensation for reservoir function. On the other hand, it has become obvious that booster-pump function fails to be expected.

Recently, bio-inert material has been developed to adapt snugly without any degenerative change. The surgical outcome following combined resection with left atrial wall is not necessarily fair, not obtaining a long-term survivor, although Nishiyama[5] has reported a 3-year-survival case. On the other hand, Takeuchi[4] reported three out of eight patients with resection of the left atrial wall survived over 3 years after surgery. In squamous cell carcinoma, complete resection is mandatory for obtaining long-term survivors.

As far as the operation may be selected for the patient without nodal involvement, the surgical outcome is not necessarily pessimistic. A wide application of En bloc resection on cardiopulmonary bypass is recommended for patients with carcinomas extending to the left atrium.

References

1) Gardner MAH, Bett JHN, Stafford EG, Matar K:Pulmonary metastatic chondrosarcoma with intracardiac extension. Ann.Thorac Surg.27: 238-241, 1978.
2) Shuman RL:Primary pulmonary with left atrial extension via left superior pulmonary vein. En bloc resection and radical pneumonectomy on cardiopulmonary bypass. J. Thorac Cardiovasc. Surg.88: 189-192, 1984.
3) Bailey CP, Schechter DC, Folk FS: Extending operability in lung cancer involving the heart and great vassels. Ann. Thorac. Surg.11: 140-150, 1971.
4) Takeuchi N, Katsumoto K, Niibori T, et al: Evaluation of combined resection with the left atrium for lung cancer. Jpn. J. Thorac. Surg.31: 1448-1454, 1983.
5) Nishiyama S, Tengan Y, Matsuyama T et al: The limit of surgical treatment for advanced lung cancer-The limitation of extended combination resection-. Jpn. J. Surg.83: 979-982, 1982.