

The Clinical Evaluation of Radical Lobectomy with  
Sleeve Resection of both the Bronchus and  
the Pulmonary Artery for Lung Cancer

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Operative procedures of lobectomy with sleeve anastomosis of both the bronchus and pulmonary artery were evaluated in 5 patients undergone surgery.

1) The indications of this operation exist in patients with hillar type of lung cancer with cancerous invasion into the wall of the pulmonary artery segmentally.

The lesions in left side were not infrequently indicated rather than that in right side.

2) Three patients were followed for three months to 2 years and 3 months.

Two of them are alive from 3 months to 2 years and 3 months without recurrence respectively.

The remaining one died in one year and half postoperatively of local recurrence and distant metastasis.

3) We encountered in 2 cases of hospital death unrelated operative techniques. From one experience of autopsy on postoperative 12th day, the ischemic lesion of the lung was detected following the cessation of pulmonary flow by torsion in the anastomotic site. It was emphasized that pulmonary blood flow is necessary to nourish the lung under interruption of bronchial flow by bronchoplastic procedure.

The cause of the remaining one was hemorrhagic diathesis owing to hyperfibrinolytic activity.

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## INTRODUCTION

Recently the technical improvement of diagnosis for lung cancer has made it possible detect and treat in early stage.

Furthermore, the most effective therapeutic procedures have been evaluated among the combination of various treatments for lung cancer according to classification of histological type and of clinical stages.<sup>1)2)3)</sup>

However, there is no doubt that the gain of the most excellent survival rate was achieved in patient with resectable carcinoma compared with non-resectable carcinoma.

From the view of surgical treatment for lung cancer, the elimination of postoperative complication and the preservation of pulmonary function after surgery are indispensable to maintain an favorable prognosis following surgery.

In hilar type of lung cancer, pneumonectomy had been applied as routine operative method. However, bronchoplastic procedures had been used in order to preserve pulmonary function and to enlarge the extent of resected bronchial wall without pneumonectomy following the improvement of surgical technique.

Sleeve resection of both the bronchus and the pulmonary artery has been performed in hilar type of lung cancer with cancerous invasion into the wall of the pulmonary artery.

The purpose of this study is to analyse some problems with special technical reference to this operation.

## CLINICAL MATERIAL

Five patients undergoing sleeve resection of both the bronchus and the pulmonary artery subjected to this study as shown in Table 1.

The age of these patients were ranging between 51 and 71 years. The location originated carcinoma were upper lobe bronchus in all five cases.

Three cases of 5 patients had carcinoma arising from left upper lobe bronchus and

**Table 1** Cases with sleeve resection of both the bronchus and the pulmonary artery

case No.	1	2	3	4	5
age	65	58	51	72	70
histology	squamous ca.	squamous ca.	squamous ca.	squamous ca.	squamous ca.
affected bronchus	left upper	left upper	right upper	left upper	right upper
prognosis	2y2m alive	12 d postop. dead	1y6m alive	48 h postop. dead	2y2m alive
remarks		tension pneumothorax following rupture of bullae		uncontrollable bleeding due to hyper- fibrinolysis	

the remaining 2 cases had that from right upper lobe bronchus.

The radiological features on chest xp film were characterized by the finding of pulmonary inflammation and atelectasis secondary to bronchical obstruction in appearance and histological pattern was squamous carcinoma in all cases.

These patients were undergone radical lobectomy with sleeve resection of both the main bronchus and the main pulmonary artery as well as mediastinal dissection. The main pulmonary artery and main bronchus which were resected segmentally in the specimen have been shown in Fig. 1.

Cancerous invasion into the wall of pulmonary artery with firm adhesion was seen at the time of operation.

The angiographic findings of the segmental stenosis and defect of its branch on the pulmonary artery were potentially useful to determine the indication for performing of this operation prior to surgical intervention as presented in Fig 2.

In all five cases, there were seen the localized abnormality on pulmonary angiography. The lobectomy with sleeve resection of both the bronchus and the pulmonary artery comprises two major operative techniques, that is (1) segmental resection of both the bronchus and the pulmonary artery and (2) reconstructive procedures employing anastomosis between proximal and distal portion in both the bronchus and the pulmonary artery.

This techniques were accomplished by no any trouble and there were no any complications related to technical errors.

However, we were encountered in 2 cases of operative death. One of these 2 cases died of severe dyspnea on the 12th postoperative day. The other died in 24 hours



Fig 1. Resected specimen which showed segmental resection of both the bronchus and pulmonary artery.

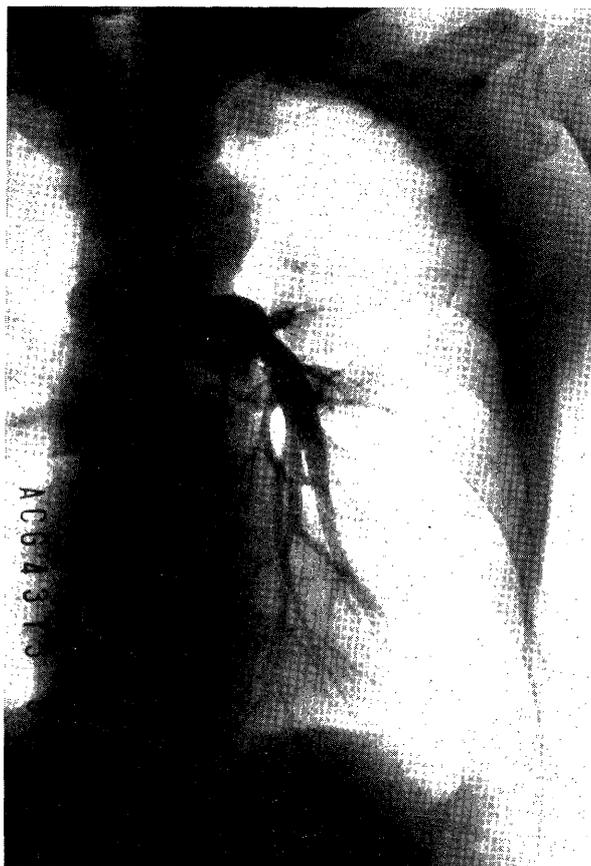


Fig 2. Preoperative angiogram of pulmonary artery which demonstrate the segmental narrowing and defect of its branching artery in itself

postoperatively of uncontrollable bleeding unrelated operative technique.

In contrast, postoperative course in the remaining 3 out of 5 cases were uneventful and these survivor showed satisfactory reserved pulmonary function, which present the efficacy of this operative maneuver.

## RESULTS

Of the 5 patients operated upon, two died within the time of less than 30 days after operation.

The remaining three patients were well without recurrence.

During follow-up study, one died of local recurrence and bone metastasis into the ribs (II, III IVth rib on right side) and thoracic vertebra (V. VIth) at one and half years after surgery.

In patients with postoperative recurrence and metastasis, there were seen the advanced-cancerous spreading into the lymphnodes in the mediastinum beyond hilar region at the

time of operation.

Therefore, it is impossible to expect an excellent prognosis for those patients with diseased mediastinal lymphnodes.

One died of severe dyspnea on 12th day after surgery.

The autopsy demonstrated tension pneumothorax following the rupture of bulla on the lung with reconstructed bronchus.

It was emphasized that meticulous cares during and after surgery should be designed to prevent catastrophes unrelated to operation.

Furthermore, interestingly enough, the ischemic and necrotic lesions which was found out at autopsy on the bronchial reconstructed lung are less experienced with serious problems of this operative method.

Although the bronchial arteries ordinary nourish the lung rather than the pulmonary arteries, the nutritional blood flow mainly originates from pulmonary arterial flow for the lung with the interruption of the bronchial artery caused by sleeve anastomosis of the bronchus.

From clinical study of this cases received autopsy, it is appeared that the reduction or interruption of the pulmonary blood flow after bronchoplasty gives rise to the nutritional defect under a situation of ceasing bronchial flow.

When sleeve resection of pulmonary artery was employed, technical attention should be paid to avoid the rolling and kinking in anastomotic site of pulmonary artery.

The increment of pulmonary flow needs for nutrition of the lung in which nutritional bronchial blood flow is ceased by bronchoplasty.

The other of hospital death was due to uncontrollable hemorrhagic diathesis following hyperfibrinolytic activity which showed 40mg value in FDP level immediately after operation.

From above cause of death, there are some factors associated with this procedures to facilitate fibrinolytic activity. In this cases, two factors seems to relate to promotion of hyperfibrinolysis, first, old patient over 70 years of age, second, release of a large amount of tissue activator by manipulation of the lung during operation.

## COMMENT

The operative salvage in majority cases of lung cancer is facilitated by early diagnosis.

In hilar type of lung cancer originating from lobar bronchus, it had been believed that pneumonectomy is an indispensable operative method for gain of operative radicality.

Meanwhile, it is well defined that the prognosis after pneumonectomy is poor rather than that after radical lobectomy for lung cancer, especially in the elderly.

More recently it is emphasized that pneumonectomy should be excluded as much as possible to maintain pulmonary function after surgery.<sup>4)5)</sup>

From above results, those who with hilar type of lung cancer in the aged group

are of the most ideal candidate for this operation without pneumonectomy.

Furthermore, when cancerous invasion reaches segmentally into the wall of pulmonary artery, sleeve resection of the pulmonary artery should be carried out in combination with bronchoplasty.

It was confirmed that this operation posed so little threat into life and end to end anastomosis of the pulmonary artery was achieved with no any technical speciality compared with routine vascular reconstruction.

This operative technique seems to make it to reduce a chance of the dissemination of tumor cell into hematogenous route during operative manipulation.

Furthermore, for the purpose of the preservation of pulmonary function after surgery, this operative technique is necessary to maintain an adequate ventilatory lung without pneumonectomy.

Many reports<sup>4)5)</sup> noted that a 5 years survival rate after radical lobectomy with sleeve resection is similar to that after radical lobectomy.

Radical lobectomy with sleeve resection is enough to suppress the recurrence of carcinoma compared with wide resection such as pneumonectomy.

The efficiency of this operative procedures should be evaluated by many investigators in vast majority of cases.

The aim of present study was to certify the advantage of this operative procedures in regard to radicality for carcinoma.

From a follow up study, it is defined that this operative technique achieves an excellent reservation of pulmonary function following surgery and enable the enhancing radicality by extended resection through bronchial wall.

Furthermore, it is pathophysiologically defined in this study that the interruption of bronchial artery by bronchoplasty does not influence on pulmonary nutrition although the flow of pulmonary artery plays an important role instead of bronchial flow.

If a decrease of pulmonary blood flow occurs by ill anastomosis of pulmonary artery following segmental resection, the ischemic changes will be anticipated as the postoperative hazard in reconstructed lung.

Therefore, an attempt of prevention from hindrance of pulmonary blood flow should be undertaken in this operative procedure.

From our experience of autopsy, the nutritional significance of pulmonary blood flow is documented under interruption of bronchial flow by bronchoplastic procedures.

From the view of operative technique, torsion and kinking of pulmonary artery after vascular anastomosis is one of the main etiological factor related to decrease of pulmonary perfusion which may produce the ischemic lesion.

It virtually demands an adequate maintenance of pulmonary flow under a situation of interruption of bronchial flow.

Of one of operative death, uncontrollable bleeding diathesis was demonstrated by hyperfibrinolytic activity which is suggested that a large amount of tissue activator might be released by blockage of pulmonary flow during vascular anastomosis.

The release of tissue activator is considered to accelerate by compression of the lung at the time of operation.

It is not well defined as to whether a cessation of blood flow during vascular anastomosis attribute to occurrence of hyperfibrinolytic activity which is suggesting a promotion of release of tissue activator.

However, it is recommended that vascular anastomosis of the pulmonary artery should be performed with less consuming time because of obtaining in short term of ceased blood runoff into the lung.

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