

Clinical Evaluation with Reference to Operative Specificity on Tracheal and Bronchial Reconstruction

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The clinical specificity were evaluated in those 11 cases who underwent tracheal reconstructive surgery and in those 25 cases who underwent bronchial reconstructive surgery respectively.

Its prognosis after tracheal reconstruction at the level of intrathoracic region was extremely poor. The operative specificity with regard to tracheal surgery consist of being a poor general condition preoperatively and of having an urgent demand of removal of tracheal stenotic lesion to alleviate respiratory distress. The prognosis after tracheal surgery was commonly poor and was similar to that after emergency operation as a general acceptance for the reason of unfavorable general condition.

The present study was to define clinical problems in which the salvage after tracheal surgery was entirely difficult. The improvement of the prognosis following tracheal surgery should be found in maximum endeavor for prevention of postoperative complication related to operative death intimately.

However, terminal tracheostomy employed for lesions of cervical trachea was one of

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satisfactory operative procedures for alleviation of dyspnea and wheezing arising from stenosis of cervical trachea.

Meanwhile, the results after performing bronchial reconstruction were good and enlarging the operative indication of bronchoplastic procedure was recommendable for preservation of pulmonary function and for obtaining of extended resection and the operative indication of bronchial reconstruction should be extend to the treatment for cicatric stenosis, bronchial adenoma and traumatic rupture.

INTRODUCTION

The prognosis of tracheal reconstruction was extremely poor compared with that of bronchial reconstruction.

Several factors associated with increased risk for surgery are as follows.

1) preoperative poor condition with dyspnea and cyanosis. 2) technical difficulty of respiratory care during operation. 3) complexity of reconstructive procedures due to the wide extent of stenotic lesion. 4) the high incidence of postoperative complications resulted in death.

The development of tracheal surgery might be achieved to overcome these clinical troubles.

The patients undergone reconstructive operation of tracheobronchial tree are increasing in number with the improvement of surgical technique, the establishment of safety respiratory care during operation and enlarging the indication of surgical treatment.

More recently the operative indication seems to select for the traumatic injuries, cicatric stenosis and benign or malignant tumor of the tracheobronchial tree. However, the reconstructive techniques are directly associated with threat to life.

The surgical indication, therefore, should be determined carefully in patient with a disorders of tracheobronchial tree. The aim of the present study was to certify the clinical difference between tracheal and bronchial diseases to enlarge the widespread application clinically.

CLINICAL MATERIAL

Thirty-seven patients underwent operative treatment for disorders of tracheobronchial trees, 12 out of them had tracheal reconstruction and the remaining 25 had bronchial reconstruction as shown in table 1.

Male is affected predominantly rather than females and age varies from 16 to 69 years.

In the aged group, the etiology of these lesions are chiefly malignant disease which is demonstrated as cancerous invasion into the trachea and the bronchus from bronchogenic carcinoma and thyroid cancer, whereas traumatic injuries are main lesion in the young.

According to the severity of traffic accident, there are many chances to encounter in the patients with bronchial rupture by blunt chest trauma. we have the experience in 2 cases with traumatic injuries.

They had in all 2 cases shortness of breath, bloody sputum with pneumothorax and

Table 1. Cases undergoing tracheobronchial reconstruction

Disease		cases with tracheal surgery	cases with bronchil surgery
Traumatic rupture	direct suture	1	
	sleeve		1
Cicative stnosis	sleeve	1	1
	wedge	1	
	patch	1	
Malignant Disease	terminal tracheostomy	4	
	patch	1	2
	sleeve	1	13
	replacement by artificial trachea	1	
	wedge		6
Bronchial adenoma	sleeve		1
	wedge	1	1
		12	25

subcutaneous emphysema in cervical region. Such a Ventilatory failure was characterized as the severity out of proportion to the degree of traumatic injuries on thoracic wall.

Of 4 cases with cicatric stenosis, 3 cases had tracheal stenosis, 1 case had a extensive stenotic lesion in length from the upper portion of the intrathoracic trachea to bilateral main bronchus involving tracheal bifurcation, the other 2 cases showed segmental stenosis arising from tuberculous inflammation and mechanical irritation by endotracheal catheter tip.

Of 3 cases with bronchial adenoma, one had tracheal stenosis by adenoid cystic carcinoma and the remaining 2 cases had stenosis of right main bronchus by carcinoid type and mucoepidermoid tumor respectively.

Of 28 out of 37 cases, the etiology of producing stenotic lesion were malignant disease in which 4 cases had thyroid cancer, 1 esophageal carcinoma, 23 lung cancer respectively.

Of 37 cases with reconstructive surgery of tracheobronchial tree, tracheal reconstruction was carried out in remaining 12 cases although bronchial reconstruction was performed in 25 cases

RESULTS

The affected location of the tracheobronchial tree were shown in Fig 1. The lesion in cervical trachea were seen in 5 cases and one of these 5 cases had traumatic injuries and the remaining 4 cases had cancerous invasion from thyroid cancer.

In one patients with tracheal recostruction in thoracic region artificial tracheal substitute is necessary to achieve an adequate reconstruction for extensive defect in length after resection for cicatric stenosis.

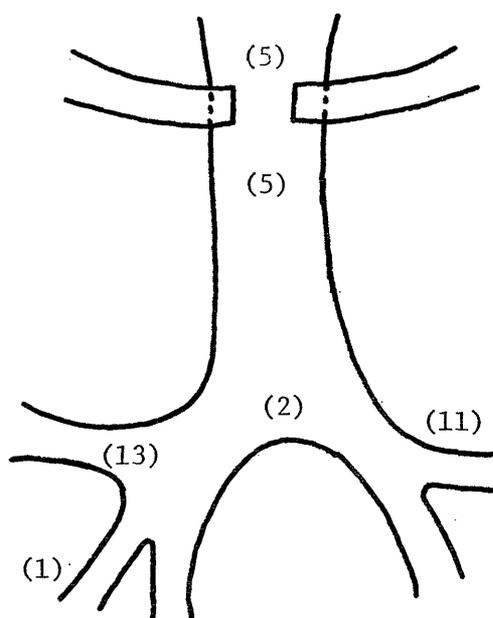


Fig 1. The numbers of cases with reconstructive surgery and the affected location of tracheobronchial tree

Silastic tube in this case was utilized as the substitute of the trachea after removal of stenotic lesion in almost entirely length of intrathoracic trachea including bilateral main bronchus and the carina.

However, its prognosis was poor and died at 8 hours after surgery of bleeding diathesis and postperfusion lung syndrome provoked prolonged extracorporeal circulation time of about 4 hours which was necessary to support perioperative respiration due to tracheal stenosis. One with cicatric stenosis of the trachea had a satisfactory result by patch method with pericardium and the remaining one with tracheal stenosis following tracheostomy had recurrence of stenosis sequent to reconstructive surgery. All of them died of postoperative pulmonary complication. From these results, it seems to be partly associated with denervation of the lung after reconstructive procedures. An attempt to advanced tracheal surgery, therefore, appears to be in effect to prevent pulmonary complication postoperatively.

Of 25 cases treated with bronchial reconstruction, 24 cases had bronchoplastic procedures performed for the main bronchus. The remaining one had reconstructive plasty for the right middle truncus. None of them had postoperative death and its prognosis were excellent except one death by anastomosis insufficiency due to frequently endotracheal aspiration procedures to alleviate aspiration pneumonia although 7 cases had postoperative complication in which pulmonary complication were seen in 3 cases, pyothorax in 1, liver dysfunction in 1, anastomotic stenosis in 1

The clinical differences in patients with surgery of tracheal and bronchial reconstruction were analyzed in several factors as shown in Table 2.

The significant differences with regard to sex and age distribution are found out in

Table 2. Postoperative complication

	cases with tracheal surgery	cases with bronchial surgery
infection	2 (1)	
pulmonary complication	2 (1)	3
pyothorax hemothorax	1 (1)	1
liver dysfunction		1
postperfusion lung syndrome	1 (1)	
anastomosis insufficiency		1 (1)
anastomotic stenosis		1

() death

neither those patients undergone tracheal nor bronchial reconstruction.

The etiology of occurring tracheal lesion were essentially same as that of bronchial lesion. The most predominant difference consists in preoperative symptoms, that is, the chief complaints were wheezing and bloody sputum in those whom tracheal surgery was performed whereas no severe respiratory symptoms such as cough and sputum complained in those with bronchial surgery.

The preoperative condition was extremely poor in those who having a tracheal reconstruction due to severe respiratory distress compared with those who having a bronchial reconstruction.

Postoperative complications occurred in 6 cases with tracheal surgery and in 7 cases with bronchial surgery as shown in Table 2. The most of them were demonstrated as pulmonary complication owing to infection.

The incidence of postoperative complication in those patients with tracheal surgery was the same in those with bronchial surgery.

However, the postoperative complication was directly associated with operative death in those patients with tracheal surgery and the high incidence of postoperative complication was the most important factors which had rendered the patients moribund after tracheal surgery.

The various operative methods were applied on reconstruction of tracheobronchial

Table 3. Operative procedures

	cases with tracheal surgery	cases with bronchial surgery
direct anastomosis	1	
terminal tracheostomy	4	
patch with fascia	1	
diaphragm	1	
pericardium		2
sleeve anastomosis	2	16
artificial substitute (silastic tube)	1	
wedge resection & anastomosis	2	7

tree. Especially the complexity of surgical procedures was recognized on the tracheal reconstruction such as direct anastomosis after resection, terminal tracheostomy in the anterior mediastinum, patch method and sleeve anastomosis. (table 3)

The prognosis after reconstructive surgery does not make surgeon satisfactory. when the replacement with artificial trachea were employed, there were observed the poor prognosis.

However its prognosis after tracheal surgery is not only associated with operative method but also is related to preoperative general condition as well as the severity of postoperative complication.

COMMENT

The reconstructive surgery for the trachea and the bronchus has a further advancing field for wide clinical acceptance.¹⁾²⁾³⁾⁴⁾⁵⁾

However, following the development of anesthesia and preoperative or postoperative cares, the procedures of the tracheal or bronchial reconstruction for its lesion were applied to relieve and alleviate the suffering from dyspnea. In Japan, the statistical evaluation for tracheobronchial surgery was performed by Hayashi et al.⁶⁾ According to their analysis, the rate of surgical success for the trachea was 57% in contrast with 89% for the bronchus. Our studies also resulted in the favorable prognosis of surgery for the bronchus compared with that for the trachea.

The aim of the present study was to certify several factors associated with clinical differences between tracheal and bronchial surgery. It is apparent from these study that its prognosis after tracheal surgery was poor rather than that after bronchial surgery.

In those cases who underwent reconstructive surgery for the trachea in either cervical or thoracic region, its prognosis differ definitely between cervical and thoracic trachea. In majority of those cases with a reconstructive surgery in cervical trachea, the lesion was characterized by cancerous invasion from carcinoma of the thyroid gland and terminal tracheostomy in the anterior mediastinum advocated by Grillo⁷⁾ for repair of stenosis was eventually utilized as a operative method.

The early and late prognosis after terminal tracheostomy are excellent until at least the recurrence of carcinoma occurs.

By long term follow-up study, no manifestation of threat to life and no ill effects have been noted except interference with phonation.

In general, its prognosis after surgery of tracheal reconstruction are poor except that after surgery of cervical trachea. In contrast with these results, its prognosis after performing bronchial reconstruction are far superior to that after tracheal reconstruction.

Currently bronchoplastic procedures of the bronchus is applied as surgical treatment for the patients with hilar type of lung cancer to maintain the preservation of pulmonary function after surgery.

It is defined by some investigators that pulmonary resection with bronchoplastic

procedures are the valuable and commendable operative method from the view of the prognosis and postoperative pulmonary function.

From the present study, causative factors were analyzed clinically with reference to poor prognosis after tracheal surgery. We were concerned about the degree of preoperative respiratory distress which relate directly to operative death.

Aside from clinical sign, the difficulty of surgical technique and the complexity of respiratory care during operation have also related to surgical mortality.

When the extent of tracheal lesion lies in length of more than 6 cm through longitudinal axis, artificial prosthesis is necessary to perform the tracheal reconstruction. However, inconsistent successful rates of experimental tracheal replacement have caused surgeons to be reluctant to use prosthetic trachea. For further advancement of tracheal surgery, it demands to facilitate an ideal development and the safety clinical application of tracheal prosthesis.

Since the occurrence of postoperative complication associates virtually with a trigger of postoperative death, the low incidence of postoperative complication allows to overcome various hinderance in the course of development of tracheal surgery.

However, the major complications such as pulmonary infection appeared to reflect immunological incompetence prior to operation.

The early diagnosis and restricted determination of surgical indication are indispensable not only to establish a safety application of tracheal surgery but also to alleviate progressive respiratory distress.

REFERENCE

- 1) CHIDRESS, M. E.: Tracheogenic carcinoma: Successful management by excision and intercostal-periosteal pedicle graft. *J. Thoracic. Cardiovasc. Surg.*, 64:573, 1972
- 2) FALLAHNEJSD, M., HARRELL, D., TUCKÉR, J., chondrosarcoma of the trachea, *J. Thorac. Cardiovasc. Surg.*, 65:201, 1973
- 3) ECKER, R. R., LIBERTINE, R. V.: Injuries of the trachea and bronchi. *Ann. Thorac. Surg.*, 11:289, 1971
- 4) JENSIK, R. J., FABER, L.P., MILLOY, F. J. and AMATO, J. J.: Sleeve Lobectomy for Carcinoma: A ten-year experience. *J. Thorac. Cardiovasc. Surg.*, 64:400, 1972
- 5) LYUN, R. B. and IYENGAR, K.: Traumatic rupture of the bronchus. *chest.*, 61: 81, 1972
- 6) SHUICHI HAYASHI.: Tracheo-bronchial reconstruction. *J.J. tracheoesoph.* 20:1, 1969, in Japanese.
- 7) GRILLO, H. C. : Terminal or mural tracheostomy in the anterior mediastinum. *J. Thorac. Cardiovasc. Surg.*, 51:422, 1966