

# Using Insulation-Tipped Knife for Rigid Bronchoscopic Dilatation of Benign Tracheobronchial Stenosis

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#### BACKGROUND

Tracheal or bronchial tears are potential complications of rigid bronchoscopy, which may result in pneumothorax, pneumomediastinum, or malpositioning of the stent.

Before performing bronchoscopic dilatation of benign tracheobronchial stenosis using a rigid bronchoscope and/or balloon, laser or electrocautery can be used to cut the stenotic lesions with dense fibrosis to minimize injury of adjacent normal mucosa. Although the use of an electrocautery knife is usually safe, it should be applied carefully in the stenotic trachea or bronchus because the site distal to the narrowed lesion is seldom visible and is exposed to the risk of injury to normal airway structures.

The insulation-tipped (IT) diathermic knife is an endoscopic instrument with a small ceramic ball attached as an insulator to the end of a needle knife to prevent perforation (Figure 1). This study aimed to investigate the acute complications and outcomes of using an IT knife in combination with rigid bronchoscopic dilatation for treating benign tracheobronchial stenosis.

### METHODS

We conducted a chart review of patients with benign tracheobronchial stenosis who were treated with rigid bronchoscopy and an IT knife at two referral centers.

An IT knife was inserted through a 2.8 mm working channel of the BF 1T260 and manipulated to cut the stenotic lesions with dense fibrosis using the current delivered from the high frequency electrosurgical system (VIO 300 D, ERBE, Tübingen, Germany) (Figure 2).

Treatment success was defined as a clinically stable state without worsening symptoms after 3 months of treatment.

### RESULTS

Of the 23 patients with benign tracheobronchial stenosis, 15 had tracheal stenosis and 6 had main bronchial stenosis. Among them, three cases were of simple stenosis (13%), while the others were of complex stenosis (87%) (Table 1). The overall treatment success rate was 87.0%. Pneumomediastinum and subcutaneous emphysema occurred due to bronchial laceration in two cases of distal left main bronchial stenosis (8.7%), and no other significant acute complications developed (Table 2). Silicone stents were inserted in 20 patients, and successful stent removal was possible in 11 patients (55.0%). Six of the seven stents inserted in patients with post-intubation tracheal stenosis were removed successfully (85.7%). However, most of the patients with post-tracheostomy tracheal stenosis required persistent stenting (80%). Pulmonary function was significantly increased after treatment, and the mean increase in the forced expiratory volume in 1 s was 391 ± 171 mL (160-700 mL).



Figure 2



(A) A brochoscopic image of a case of fibrostenosis at the proximal left main bronchus. (B,C) Example images of cutting the dense fibrotic lesion with an IT knife and electrosurgical system.

### Table 1. Characteristics of the study patients

|                         | Patients (n = 23)  |            |
|-------------------------|--------------------|------------|
| Age (years)             | $54.2 \pm 14.8$    |            |
| Sex (male/female)       | 9/14 (39.1%/60.9%) |            |
| Site of stenosis        | Trachea            | 15 (65.2%) |
|                         | Main bronchus      | 6 (26.1%)  |
|                         | RBI                | 2 (8.7%)   |
| Reason of stenosis      | PITS               | 9 (39.1%)  |
|                         | PTTS               | 6 (26.1%)  |
|                         | Post-infectious    | 7 (30.4%)  |
| Nature of stenosis*     | Post-operative     | 1 (4.3%)   |
|                         | Simple             | 3 (13.0%)  |
|                         | Complex            | 20 (87.0%) |
| Length of stenosis (mm) | $32.6 \pm 12.4$    |            |
| Stent insertion         | 20 (87.0%)         |            |

#### Table 2. Overall treatment outcomes

|                          | Patients $(n = 23)$ |
|--------------------------|---------------------|
| Acute complication       | 2 (8.7%)            |
| Treatment success*       | 20 (87.0%)          |
| Successful stent removal | 11/20 (55%)         |
| Stable with stent        | 6/20 (30%)          |
| Surgical treatment       | 1 (4.3%)            |
| Death                    | 2 (8.7%)            |

## CONCLUSION

The combined use of an IT knife with rigid bronchoscopy can be suggested as an effective and safe modality for treatment of benign tracheobronchial stenosis. This technique may help in loosening the dense fibrotic stenosis and facilitate mechanical bougienage with a lower risk of airway injury. 제주대학교병원

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