

2. Metallic Stent in Tracheobronchial Tree

고려대학교 의과대학 진단방사선과학교실

조성범

Tracheobronchial obstruction

dyspnea, hypoxemia, postobstructive pneumonia, life-threatening ventilatory failure frequently occurs if the obstruction is not relieved

Treatment options

1. Surgical resection and reconstruction

definitive treatment.

difficult in cases of anatomical limitations, metastatic disease, and poor general condition

Tx. failure in 5-15% due to anastomotic granulation, fibrosis, excessive tension or devascularization

2. Laser resection, cryotherapy, electrocautery, core-out

not indicated in submucosal lesion or extrinsic compression

long and complicated stenoses with uncertain anatomy

high risk of bronchial rupture

3. External-beam radiation therapy, brachytherapy

unable to obtain immediate Sx. relief

4. Interventional procedures

Balloon dilatation

reasonable first option for benign stricture

high recurrence rate (30-50%)

not suitable in case of malignancy

poor results in granulation stricture, tight stricture, tracheobronchomalacia

Tracheobronchial stenting

effective in submucosal, extraluminal lesion as well as intraluminal lesion

prompt relief of respiratory distress

also useful in benign disease, especially tuberculosis

Metallic stenting in tracheobronchial tree

In 1950, Belsey in op. field

In 1986, Wallace expandible metallic stent under bronchoscope

1. Indications

* Inoperable malignant disease

extraluminal compression

submucosal disease

endobronchial tumor with patency less than 50% after laser therapy

aggressive endobronchial tumor growth and recurrence

loss of cartilaginous support from tumor destruction

obstruction from esophageal stenting

tracheoesophageal fistula

* Benign stenosis

prolonged or traumatic intubation

unsuccessful tracheal repair

postanastomotic stricture : sleeve resection or lung transplantation

inflammatory : tuberculosis

external compression : mediastinitis, vascular structure

tracheobronchomalacia

congenital stenosis

systemic disease : relapsing polychondritis, Wegener's granulomatosis,
amyloidosis

2. Contraindications

no absolute contraindication

relative contraindications

tumor with high bleeding potential

severe bleeding diathesis

severely ill patients with a very limited life expectancy

acute severe inflammation of the airway

3. Usable types of tracheobronchial stents

Tube stent and Metallic stent

1) Tube stent

Made of silicone

usually rigid bronchoscope and general anesthesia

frequent migration, low internal to external diameter ratio,

impairment of mucociliary clearance, less flexible

2) Metallic stent

* Types of metallic stent

Balloon-expandible ; Palmaz, Strecker

Self-expandible : Gianturco, Wall, Ultraflex, Niti, ect.

Uncovered stent ; inert alloy without coating

Covered stent ; inert alloy with silicone or polyurethane coating

* Advantages of metallic stent

ease of insertion

fluoroscopy or flexible bronchoscopy guidance

topical anesthesia

greater radial force, flexibility, conformability

less migration

superior internal to external diameter ratio

usable in smaller airways

* Disadvantages of metallic stent

propensity to develop excessive granulation tissue

difficult removal and repositioning

restenosis by tumor or granulation tissue ingrowth

fracture

* Uncovered vs Covered metallic stents

Uncovered		Covered	
Advantages	Disadvantage	Advantages	Disadvantages
Low migration	Tumor ingrowth	No tumor ingrowth	High migration
Superior M.C.	Not suitable for ERF	Suitable for ERF	Can close small bronchi
Low sputum retention	Difficult removal	Less stent fracture	Low M.C.
	Risk of stent fracture	Removable	High sputum retention

* Recently, several investigators have asserted that covered stents are definitely more advantageous than uncovered stents as they can be removed when there are complications, such as stent migration, or when they are no longer necessary as in patients with endobronchial tuberculosis or lymphoma following treatment.

	Sawada *	Miyazawa**	Monnier***	Shin****
No. of patients	14	44	40	35
Types of stents	U.G.	U.U.	C.W.	C.N.
Technical success(%)	100	100	98	100
Clinical success (%)	86	82	86	92
Stent migration (%)	0	0	12	17
Tumor ingrowth (%)	21	24	0	0
Sputum retention (%)	NA	9	38	20

* *Radiology 1993;188:205-208*

** *Chest 2000;118:959-965*

*** *Chest 1996;110:1161-1168*

**** *JVIR 2003 14:1525-1534*

4. Covered Retrievable Metallic Stents in Malignant Tracheobronchial Stricture

* 35 malignant stricture unsuitable for surgery (8 patients: combined ERF)

- 17: lung cancer 11: esophageal cancer
- 4: mediastinal malignancy 1: tracheal cancer
- 1: intraluminal metastasis, 1: thyroid cancer
- * Site of stricture
 - 17: trachea 10: left MB
 - 3: right MB 3: trachea + left MB 2: trachea + right MB
- * Indications for stent removal : in case of complications
- * Technical success – 100%, misplacement (n=7) : relocated
- * Clinical success – 92% of patients ($p < 0.05$)
- * Complications
 - stent migration (< 2wks) : 6/35 (17%)
 - tumor overgrowth : 2/35 (6%)
 - tumor ingrowth : 0%
 - sputum retention : 7/35 (20%)
- * Removal of the stent
 - 5 patients :stent migration (n=2)
 - severe pain (n=1)
 - tumor overgrowth (n=1)
 - persistent ERF (1)
- * Outcome : all patients died
 - 1–26 (mean, 9.62) weeks
 - Cause – ds. progression (n=18), pneumonia (n=9),
 - hemoptysis (n=5), unknown (n=3)

(Shin JH, Song HY et al. JVIR 2003;14:1525–1534)

5. Covered Retrievable Metallic Stents in Tuberculous Bronchial Stricture

- * Nine strictures refractory to balloon dilation
 - 8: left main bronchus
 - 1: right main bronchus
- * M:F = 2 : 7
- * Age: 15 – 36 (mean, 28) years
- * Indications for stent removal
 - elective removal : 2 or 6 months after stenting
 - in case of complications
- * Technical success – 100%, misplacement (n=1) : relocated
- * Clinical success – 100% of patients

* Complications

stent migration : 1/9 (11%)

granulation tissue : 2/9 (22%)

bronchial obstruction : 1/9 (11%)

* Removal of the stent (n=12, 9 pts)

elective removal (n=9)

2 months (n=5) - recurred in 3 pts

6 months (n=4) - no recurrence (52 mo. F.U.)

in case of complications (n=3)

- stent migration (n=1)

- granulation tissue (n=2)

(Kim JH, Shin JH et al. JVIR in press)

6. Complications

chest pain

bronchospasm

mucosal laceration - superficial or deep

pneumomediastinum

pneumothorax

mediastinitis

stent migration

- more common with plastic stent (6 - 10%) or covered metallic stent (12 - 17%)

granulation tissue formation

- more common with uncovered metallic stent

tumor ingrowth/overgrowth

- ingrowth ; uncovered metallic stent (more than 50%)

- overgrowth ; covered metallic stent (6 - 28%)

sputum retention

- more common with plastic or covered metallic stent

hemoptysis

- less with covered metallic stent