

POST INTUBATION TRACHEAL STENOSIS (PITS)

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CLASSIFICATION OF BENIGN TRACHEAL STENOSIS

- The adult trachea averages 11.8 cm in length (range 10 to 13 cm).
- Males generally have a trachea of larger diameter than females (approximately 2.3 cm coronally and 1.8 cm sagittally in males; 2.0 cm coronally and 1.4 cm sagittally in females)
- There are typically 18 to 22 cartilaginous rings within the trachea (two rings per cm, each approximately 4 mm in height)

CLASSIFICATION OF BENIGN TRACHEAL STENOSIS

- The presence of symptoms : tracheal lumen is <8 mm in diameter or >50 percent luminal narrowing
- Tracheal diameter of 4 mm usually represents greater than 70% reduction in lumen : severe degree of airway narrowing (Myer-Cotton grade III *) and stridor.

CLASSIFICATION OF BENIGN TRACHEAL STENOSIS

- Patients are frequently misdiagnosed as having asthma or COPD and often treated as such without improvement.
- Long segment narrowing : relapsing polychondritis and tracheobronchopathia osteochondroplastica (TPO)
- Short segment narrowing: stenosis due to intubation or tracheostomy , amyloidosis, inflammatory disorders, and thermal injury.

CLASSIFICATION OF BENIGN TRACHEAL STENOSIS

- **1: 50% obstruction.**
- **2. 51–70% obstruction.**
- **3. 71–99% obstruction.**
- **4. Complete obstruction.**

CLASSIFICATION OF BENIGN TRACHEAL STENOSIS

- Stage 1 in the subglottis or trachea, 1 cm in length.
- Stage 2 in the subglottis, 1 cm in length.
- Stage 3 in the subglottis and upper trachea.
- Stage 4 in the glottis with vocal cord fixation and paralysis.

CLASSIFICATION OF BENIGN TRACHEAL STENOSIS

- **Pseudo Glottic stenosis:** defined as typically “A”-shaped stenosis due to lateral impacted fracture of cartilages in patients with a history of tracheostomy.
- **Web-like stenosis:** when it involves a short segment (<1 cm) , membranous concentric stenosis without damage to the cartilages.
- **Complex stenosis:** all other stenosis were defined as such, including those with an extensive scar (≥ 1 cm), circumferential hourglass like contraction scarring, or malacia.

CLASSIFICATION OF BENIGN TRACHEAL STENOSIS

- Simple stenosis included granulomas, weblike, and concentrically scarring stenosis. All these lesions were characterized by endoluminal occlusion of a short segment (<1 cm) absence of tracheomalacia, or loss of cartilaginous support.
- Complex stenoses were represented by a longer lesion (greater than 1 cm) with tracheal wall involvement and subsequent scarring contraction of the latter, in some cases also associated with malacia.

CLASSIFICATION OF BENIGN TRACHEAL STENOSIS



Fig. 15.10 Complex tracheal stenosis



Fig. 15.9 Simple tracheal stenosis

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- Rigid bronchoscopy under general anesthesia is an essential method in the treatment of severe symptomatic laryngotracheal stenosis.
- The rigid tube serves two purposes: first, it secures the airway, and second, it can be used to dilate the airway.

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- The flexible bronchoscope can be used through the rigid scope to inspect the stenosis and the distal airway, and to aspirate retained secretions.
- Many times, rigid bronchoscopy will resolve the acute situation by dilating the stricture, and will represent a bridge to definitive treatment to be performed electively.

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- **simple severe stenosis (concentric membrane) can be immediately resolved with laser resection and dilatation with the rigid bronchoscope.**
- **Complex stenoses represent a different situation. They may be addressed initially with endoscopic therapy to overcome the acute respiratory failure, but the definitive solution is always surgery providing that the patient has a good clinical status.**

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- Stenotic lesions are prone to radial compressive forces and might respond favorably, albeit temporarily, to dilation.
- Factors negatively impacting the success rates of rigid bronchoscopic interventions include an extent longer than 1 cm and the presence of chondritis, resulting in cartilaginous collapse (malacia)
- Concerns that bronchoscopic treatment can make a lesion worse (extending its length, causing malacia, or converting a simple stricture into a complex.

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- Repeated interventions, especially if laser is used, might increase the extent of injury in some cases, possibly resulting in damage to the cricoid posterior plate.
- Similarly, stent insertion could increase the length of stenosis.
- Some experts recommend avoiding this treatment in all patients who are candidates for surgical intervention, stating that laser or stent insertion should be performed only in patients with absolute contraindications to surgery.

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- Some believe that when one or more cartilaginous rings are involved, endoscopic treatment is contraindicated unless surgery is not a consideration.
- **Silicone T-tubes (Montgomery T-tubes) or tracheostomy tubes:** These therapies are warranted in the few patients with critical stenoses who are candidates for neither surgery nor indwelling airway stent insertion, or who develop recurrence after such interventions.
- These procedures can also be used when tracheal resection and reconstruction or dilation techniques are not available or have failed, or as a solution for patients who had silicone stent placement complicated by frequent migrations.

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- For patients who fail local bronchoscopic therapy or surgery, are not good candidates for surgery, or need a bridge to surgery, a tracheostomy, T-tube, or tracheotomy may be the only option.
- Refractory cases, patients who need a bridge to surgery, and patients who are not suited to surgery may be evaluated for a tracheostomy or T tube

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- Many tracheal surgeons prefer rigid bronchoscopic dilation alone as compared with laser or stent insertion before tracheal resection because it is simpler and less costly, is associated with fewer side effects, and has less propensity to affect open surgical management

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- Endobronchial ultrasound examination using a 20 MHz radial probe can be performed at the time of initial diagnosis or at the time of treatment during flexible or rigid bronchoscopy to visualize airway wall structures at the level of stenosis and potentially to guide treatment decisions.
- For instance, for patients who are not surgical candidates, or if tracheal surgical expertise is not available, a simple stricture characterized solely by hypertrophic fibrotic tissue can be successfully dilated (with or without laser assistance) and will not require a stent;
- For a complex stenosis, in which the cartilage is destroyed, dilation alone will not be long-lasting, making stent insertion almost obligatory to maintain airway rigidity and patency.

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- Evaluate patients within two to four weeks after the procedure and then follow every one to three months until symptoms return or stability is achieved
- There are no proven predictors for recurrence, but in our experience, simple stenoses and stenoses with a reversible underlying etiology (eg, viral infection, autoimmune inflammation, short web-like stenoses) are less likely to recur than complex or fibrotic stenoses that are without a reversible etiology

SURGERY TREATMENT OF BENIGN TRACHEAL STENOSIS

- Patients who recur quickly despite one or more local bronchoscopic therapies (eg, a few weeks after a first or second local therapy)
- Patients who have an etiology unlikely to reverse with systemic therapy (eg, fibrotic scar).
- Patients with complex lesions not suitable for local therapy

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- **Type 1: Simple (web-like) stenosis: Bronchoscopic correction using electrocautery and balloon dilatation**
- **Type 2: Complex stenosis: Bronchoscopic correction can be attempted along with stent placement (Chances of recurrence of stenosis are high)**
- **Type 3: Pseudo glottic (A-shaped or tent-shaped) stenosis: Surgical correction is the treatment of choice**

ENDOSCOPIC TREATMENT OF BENIGN TRACHEAL STENOSIS

- In urgent cases the sole use of a rigid bronchoscope causes dilatation and enlargement of the airway, improving both extrinsic and intrinsic obstruction.

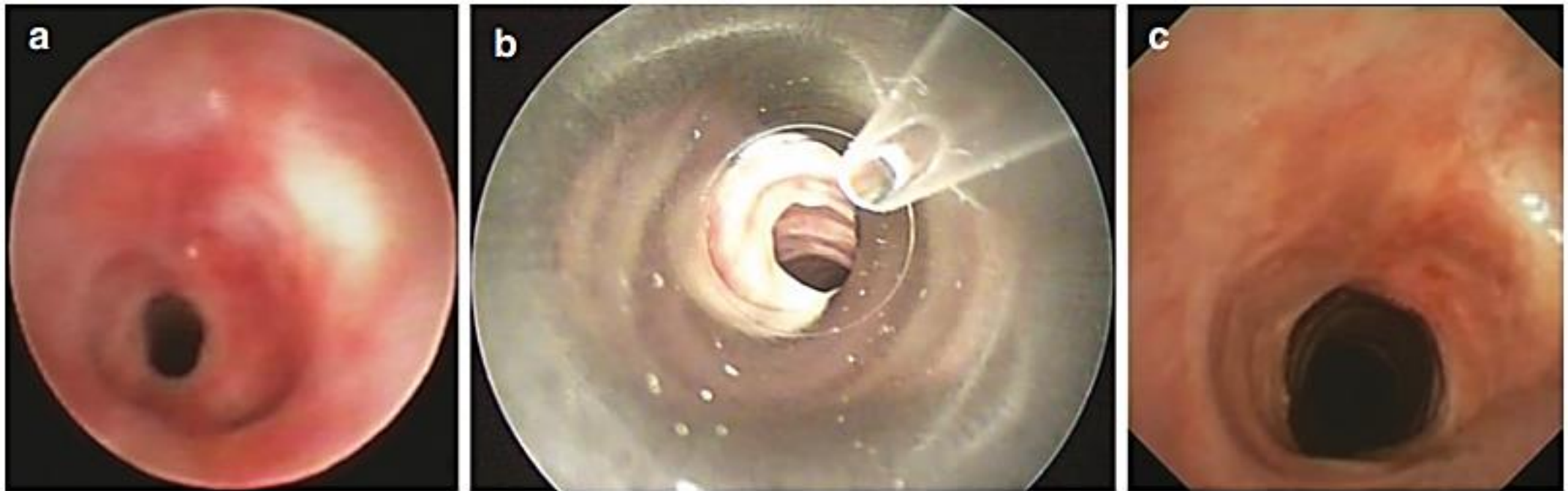
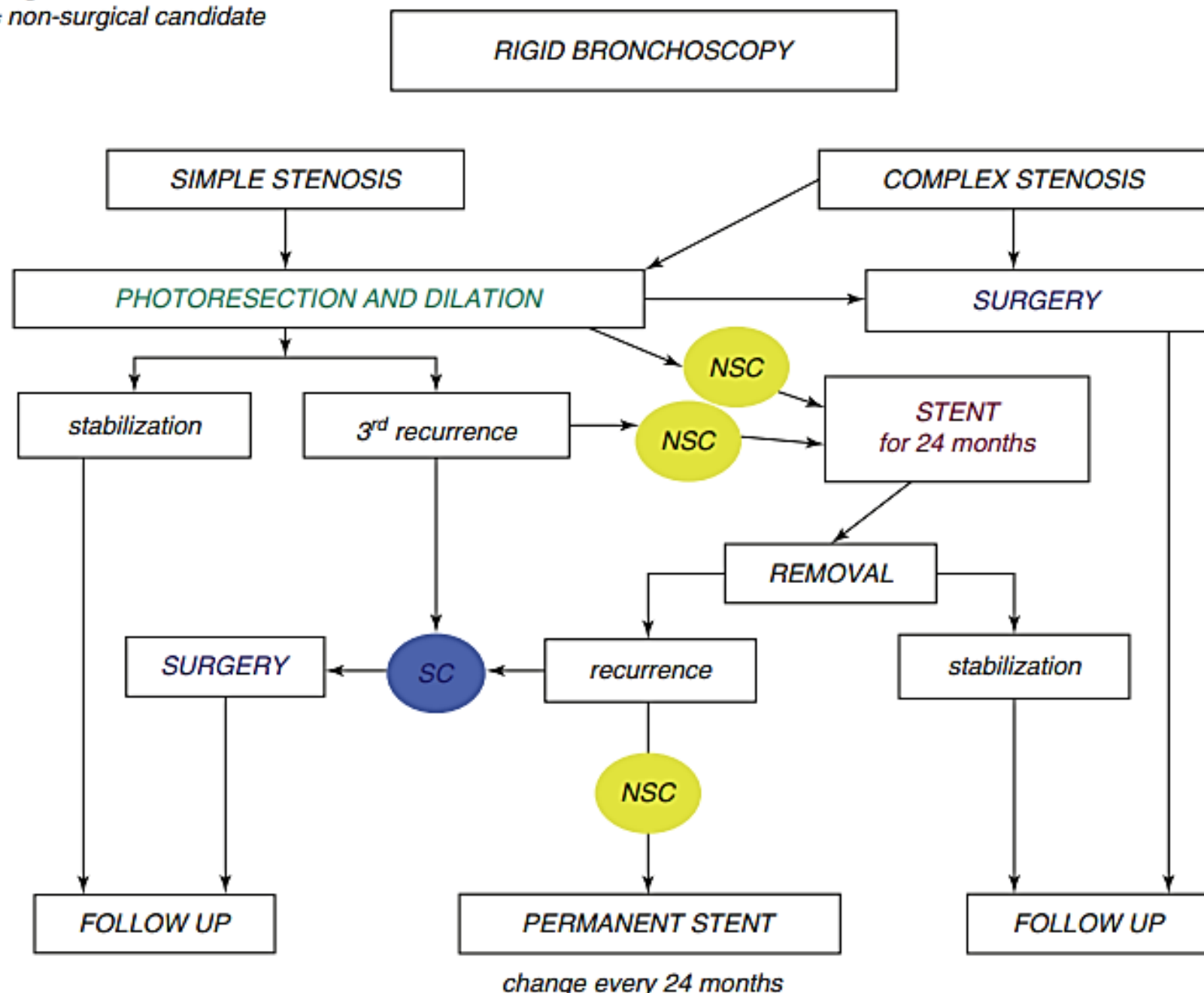


Fig. 15.14 (a–c) Dilatation with rigid bronchoscope

SC = surgical candidate
NSC = non-surgical candidate



Thank
you!

