Idiopathic subglottic stenosis: outcomes with or without the use of protective tracheostomy in single-stage cricotracheal resection

V. Cheung, G. Gelfand, S. McFadden, and J.D. Bosch. University of Calgary, Calgary AB.

Objectives

The primary objective of this study was to determine the effect of a protective tracheostomy on post-operative complications from a single-stage cricotracheal resection and reconstruction for idiopathic subglottic stenosis. The secondary purpose was to identify the rate of recurrent stenosis and functional results, and to characterize the post-operative course for these resections.

Background

Idiopathic subglottic stenosis (idiopathic laryngotracheal stenosis) is a rare inflammatory condition of unknown etiology affecting the upper airway. It is a diagnosis of exclusion, after ruling out traumatic, infectious, immunologic and congenital causes. Idiopathic subglottic stenosis can be successfully treated with single-stage resection and reconstruction. Practice varies on the use of a temporary protective tracheostomy at the time of surgery to mitigate the risk of airway obstruction from postoperative laryngeal edema. Alternatives include treatment of edema with steroids and diuresis post-extubation. Benefits of a protective tracheostomy, particularly with cricotracheal resections, include airway protection and improved secretion clearance, but with potential complications associated with the tracheostomy.

Methods

We conducted a retrospective single-institution cohort study comparing patients with or without a protective tracheostomy in cricotracheal resections. Patients who underwent surgical resection and reconstruction for idiopathic subglottic stenosis from January 1, 1994 to August 31, 2015 at Foothills Medical Centre were reviewed. Tracheal resections were excluded. For the cricotracheal resections, no protective tracheostomy was utilized prior to January 2010; subsequently, protective tracheostomy was routinely used, due to a change in practice by the surgeons. The procedure included resection of the proximal trachea, anterior half of the cricoid cartilage, excision of the mucosa and submucosa on the posterior cricoid plate and anastomosis with a posterior membranous tracheal wall flap. Follow up was one year. Data was collected through retrospective chart review. Chi-square test and student's t-test were used for statistical analysis, and performed using SPSS Statistics version 19.0.

Results

Fifty-one patients were identified who underwent a surgical resection and reconstruction for idiopathic subglottic stenosis. Thirteen patients had a tracheal resection and primary anastomosis, and were excluded. All 13 cases were performed without tracheostomy and 9 were extubated successfully in the operating room. A total of 38 patients had a cricotracheal resection and primary anastomosis, and were included in the study and analysis. The initial 11, prior to January 2010, did not have a protective tracheostomy; the subsequent 27 did. All procedures were performed by the same surgical team consisting of thoracic surgery and otolaryngology. Both groups were similar in characteristics (Table 1).

Table 1: Patient characteristics

	No protective tracheostomy (N=11)	Protective tracheostomy (N=27)
Age - years	52	48
Gender		
Male	1 (9%)	0
Female	10 (91%)	27 (100%)
Obese (BMI>30)	2 (18%)	11 (41%)
Smoker	1 (9%)	4 (15%)
GERD	5 (45%)	20 (74%)
Prior intubation	8 (73%)	21 (78%)
Prior extended intubation	0	1 (4%)
ANA or ANCA positive	0	1 (4%)
Number of endoscopic treatments before surgery	2.9	4.5
Length of stenosis (mm)	15.2	13.8
Distance of stenosis from vocal cords (mm)	17.9	15.8
Number of tracheal rings resected	2.7	2.6

p-value >0.05 for all characteristics

There was no increase in the rate of overall complications, and a decrease in the rate of airway-related complications by using a protective tracheostomy (15% vs 55%, p=0.01) (Table 2). The main tracheostomy-specific complication was wound infection (15%). Overall hospital stay was not prolonged with tracheostomy. Length of time on a ventilator (1.1 vs 2.8 days, p=0.01) and ICU stay (1.2 vs 3.8 days, p=0.001) were shorter in the group with a protective tracheostomy, an important consideration in terms of overall cost. In our series, cricotracheal resection without tracheostomy was associated with a higher rate of restenosis, early granulation and earlier recurrence (Table 3). As expected, there was a higher use of steroids to treat edema in this group.

Conclusion

The use of a protective tracheostomy is associated with fewer post-operative airway complications, a shorter duration on the ventilator and a shorter ICU stay. It is a safe approach in the single-stage cricotracheal resection and reconstruction.

Reference: Wang H, Wright CD, Wain JC, et al. Idiopathic Subglottic Stenosis: Factors Affecting Outcome After Single-Stage Repair. *Ann Thorac Surg* 2015;100:1804-11.

Table 2: Primary outcomes

	No protective tracheostomy (N=11)	Protective tracheostomy (N=27)	p-value
Post-operative complications	6 (55%)	8 (47%)	0.15
Airway related complications	6 (55%)	4 (15%)	0.01
Reintubation	1 (9%)	n/a	
Therapeutic tracheostomy	1 (9%)	n/a	
Injury to membranous portion of trachea	n/a	1 (4%)	
Airway obstruction	3 (27%)	2 (7%)	0.10
Anastomotic complication (granulation tissue)	5 (45%)	0 (0%)	<0.05
Vocal cord palsy/injury	0 (0%)	2 (7%)	<0.05
Non-airway related complications			
Wound infection at tracheostomy site	n/a	4 (15%)	
Subcutaneous emphysema	n/a	4 (15%)	
UTI	2 (18%)	2 (7%)	0.33
Atrial fibrillation	0 (0%)	1 (4%)	0.52
Dysphagia	0 (0%)	1 (4%)	0.11
Discharged home with tracheostomy	1 (9%)*	2 (7%)	
30-day readmission	1 (9%)	0 (0%)	0.11

*patient failed extubation; received therapeutic tracheostomy

One-year follow up was 81% and 100% in the tracheostomy and non-tracheostomy groups respectively. All the patients had subjectively normal swallowing and good voice, with the expected changes of decreased pitch and decreased ability to project.

Table 3: Secondary outcomes

	No protective tracheostomy (N=9)	Protective tracheostomy (N=23)	p-value
Recurrence			
Restenosis	4 (36%)	1 (4%)	0.01
Time to restenosis -months	2	48	<0.05
Perioperative results	(N=11)	(N=27)	
Hospital length of stay	10.1	11.7	0.19
ICU length of stay	3.8	1.3	<0.05
Days to extubation	2.6	n/a	
Days to decannulation	n/a	10.6	
Days on ventilator	2.8	1.1	0.01
Operative time - minutes	250	266	0.23
Use of post-operative steroids	7 (64%)	6 (22%)	0.02

This study was limited by the small sample size and retrospective design. The learning curve with cricotracheal resections may have affected the results, with higher recurrence rate in the non-tracheostomy group potentially attributable to the early operative experience with the procedure.

CONFLICT OF INTEREST DECLARATION

I, Victoria Cheung, declare that in the past 5 years:
 I have been a paid member of an Advisory Board or equivalent with the following companies: None
 I have been a paid member of the following speakers' bureaus: None
 I have done paid consulting engagements for the following companies: None
 I have received payment or funding from the following companies (includes gifts, research grants, honoraria, and "in kind" compensation): None
 I have done paid consulting work for the following companies: None
 I have held a patent for a product referred to in the program or that is marketed by a commercial organization: None
 I or my family hold individual shares in the following companies: None
 I have participated in a clinical trial for the following companies: None
 I have received payment or funding from the following companies: None