Management of Tracheal Surgery Complications

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KEYWORDS

- Tracheal surgery complications • Granuloma • Dehiscence • Restenosis
- Tracheo-innominate artery fistula

KEY POINTS

- There are several factors influencing the success of tracheal operations and the rate of complications.
- Besides risk factors on the part of the patient, such as prior tracheal surgery, tracheostomy tube in place, extent and localization of the tracheal disease, and need for release maneuvers, the experience of the surgeon also plays a major role in preventing complications.
- Good clinical judgment, careful planning of the procedure, and meticulous dissection as well as knowledge of salvage maneuvers will result in a low complication rate in tracheal surgery.
- The learning curve of tracheal surgery includes intraoperative experience and dealing with postoperative complications.
- Often observing further healing ("wait and see") instead of premature action will result in good outcome.

INTRODUCTION

Tracheal surgery in general is only rarely complicated by undesired effects; however, if complications occur, they can lead to severe morbidity.[1–3] Several factors influence the outcome after tracheal surgery, such as reoperations, preoperative tracheostomy, diabetes, pediatric patients, or the length of the resected segment.[1]

Prevention of complications starts preoperatively with treatment of acute infectious or inflammatory conditions.[4] A noninflamed mucosa is optimal for surgery and there is seldom a need for rushing an operative procedure.[2]

Intraoperative complications are extremely infrequent if the operative team is familiar with airway surgery (ie, surgeon, anesthetist, and assisting personnel), because there is a learning curve.[3,5] Management of intubation (via bronchoscopy or over the operative field) and handling of extended resections with release maneuvers do not pose a problem for an experienced team. Some postoperative complications however originate from intraoperative manipulation. These complications are anastomotic granulations, stenosis, or anastomotic dehiscence as well as bleeding from vessel arrosion. Other complications include injuries of recurrent laryngeal nerve, arrhythmias, pneumonia, or wound infection.

PREVALENCE OF POSTOPERATIVE COMPLICATIONS IN TRACHEAL SURGERY

The most complete analysis of anastomotic complications after tracheal operation was presented in 2004 by Wright and colleagues[1] from the Massachusetts General Hospital (MGH). In their review of 901 patients they identified relevant risk factors and described the management of problems. Anastomotic complications included granulations at the suture line, stenosis, and tracheal separation. A good result at the end of treatment was

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seen in 95% of patients with no need for a tracheostomy tube or T-tube (Table 1). Four percent of patients needed a permanent airway appliance, and mortality was 1.2%. They analyzed different indications of airway surgery and their complication rate (postintubation stenosis, tracheoesophageal fistula, laryngotracheal stenosis, and tumor). Overall complications were observed most frequently in the tracheoesophageal fistula group (28.6%) with anastomotic complications in 14.3% because this is the most complex group with often a tracheostomy in place (which is considered an independent risk factor because it renders the operative field infectious). The fewest problems with the anastomosis (2.4%) were seen in the laryngotracheal stenosis group for a total complication rate of 6.6% in this group. Eighty-one patients (9%) experienced anastomotic complications in their series: 37 patients had dehiscence, 7 had granulation with airway obstruction, and 37 developed stenosis. Treatment included multiple dilations (n = 2), temporary tracheostomy (n = 7), tracheal T-tube (n = 16), permanent tracheostomy (n = 14), or T-tube (n = 20) as well as reoperation (n = 16). If anastomotic complications occurred, mortality was 7.4% (6/81) compared with 0.06% (5/820) in those without anastomotic problems. Since 1988 no patients died, which is attributed to the routine use of postoperative bronchoscopy for early recognition a problems. They also described a significant reduction in suture granuloma formation since the conversion to absorbable suture material.

Wright and colleagues identified several predictors of anastomotic complications: reoperation, preoperative tracheostomy, lengthy (>4 cm) resections, and the need for a release maneuver. Other predictors of anastomotic complications were diabetes, age less than 17 years, and laryngotracheal resections (Table 2). The release maneuver itself was not considered an independent risk factor because it only indicated the need for extensive resection. Neither obesity nor corticosteroid use was associated with an increased complication rate. Management strategy is to postpone tracheal operations in the presence of high-dose steroids until they are effectively tapered.

D'Andrilli and coworkers[6] summarized complications from multiple studies in laryngotracheal resections for benign stenosis (Table 3). Again, success rates were greater than 91%. In their own group over a period of 16 years (with a mean follow-up of 61 months) they observed a restenosis rate of 11.4%. These patients were successfully treated by endoscopic interventions with final success of 100%. Friedel and coworkers[7] evaluated the long-term results of 110 tracheal segmental resections performed between 1985 and 2001. Again, healing of the anastomosis was uncomplicated in 91.8% (101 patients) and complication rates were according to what is described in the literature. They interviewed 77 patients for the long-term results 12 to 226 months postoperatively (median 80.1 months): 93.5% (n = 72) were satisfied with the surgical treatment, 75.3% were without discomfort, 9.1% reported stridor when exercising, and 11.7% complained of occasional hoarseness. Three patients required reoperation for restenosis because of suture dehiscence, foreign body granuloma, and localized recurrence of mucoepidermoid carcinoma. Only 6.5% (5 patients) were not satisfied with the results of surgery because of persistent hoarseness and stridor under exercise.

Table 1
Anastomotic complications after tracheal resection: results of MGH

	Total	PITS	Tumor	ILTS	TEF
Number of cases	901	589	206	83	21
Complication (%)	18.2	18.5	19.7	6.6	28.6
Dehiscence (%)	9.0	11.0	5.3	2.4	14.3
Mortality (%)	1.2	1.4	1.0	0	4.8
Good result (%)	95.0	95.2	97.1	98.8	90.0
Tracheal cannula (%)	4.2	4.8	2.9	1.2	10.0

Abbreviations: ILTS, idiopathic laryngotracheal stenosis; PITS, postintubation tracheal stenosis; TEF, tracheoesophageal fistula.

Adapted from Wright CD, Grillo HC, Wain JC, et al. Anastomotic complications after tracheal resection: prognostic factors and management. J Thorac Cardiovasc Surg 2004;128(5):733; with permission.

PREVENTION OF COMPLICATIONS IN TRACHEAL SURGERY

To achieve low complication rates in tracheal surgery, it is important to have a concept of protective strategy before operating.

Exact Planning of Operative Procedure

Before operation, the cause and location of the tracheal disease should be fully understood, so the surgeon can exactly plan the operative procedure and thereby reduce probable complications. Tracheal surgery, more than other operations, warrants an interdisciplinary approach whereby it is important to have competent partners, not only anesthetists but also otolaryngologists and bronchoscopists, if necessary. Besides the "how-to-do-it" also the timing of the operation or necessary