Tracheal resection and anastomosis: An 11 year management outcome

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**Objective:** To evaluate the etiology, perioperative management and outcome of surgery in cases of tracheal stenosis.

**Methods:** This was a retrospective analysis of patients with tracheal stenosis who underwent tracheal resection with anastomosis from January 2000 to December 2010.

**Results:** Ten patients, aged between 15 to 53 years old (mean of 34.4 years) were included. Post intubation injury was the major cause of tracheal stenosis (n=8), followed by external laryngeal trauma (n=2). Using the Cotton-Myer classification, 60% of patients had Grade III stenosis whilst 40% had Grade IV stenosis. Intravenous corticosteroids were given 24 hours before extubation. Four patients were well post-operatively without complications. The most common complication in the other patients was granulation tissue at the anastomosis region (n=3), vocal cord paresis (n=2) and one restenosis (n=1). Four of these patients underwent examination under anesthesia with removal of granulation tissue and/or laser dilatation. However, 2 cases needed Shian Lee operation and required T-tube until present. The success rate for tracheal resection and anastomosis is taken as the number of patients successfully decannulated, which was 80%.

**Conclusion:** Tracheal resection with end-to-end anastomosis was a successful procedure for cervical tracheal stenosis, with low mortality and few complications related to it. (Rawal Med J 2013;38: 177-180).

**Keywords:** Tracheal stenosis, laryngostenosis, acquired laryngeal stenosis, endotracheal intubation.

**INTRODUCTION**

In the majority of patients, acquired stenosis of the subglottis and trachea is due to prolonged intubation and tracheostomy. This is because of the increasing use of mechanical ventilation in the intensive care units. This may explain the increasing rate of laryngotracheal stenosis in post-intubated patients, ranging from 0.6 to 21%. Although several grading systems have been proposed, the universally accepted grading of laryngeal stenosis was devised by Myer et al in 1994. Following the works of Grillo and Pearson since the late 1970s, the complete resection of the stenotic segment with primary anastomosis has been accepted as the procedure of choice because of its high success rate (71-95%) and minimal morbidity. Currently, excellent results have been reported in many large series. The objective of this study was to evaluate the etiology, perioperative management and outcome of tracheal resection with anastomosis, being performed in a tertiary care hospital in Malaysia.

**METHODOLOGY**

This retrospective analysis was carried out at the Department of Otorhinolaryngology, Head and Neck Surgery, Universiti Kebangsaan Malaysia Medical Centre, Malaysia, which is a tertiary care hospital. The study included patients who underwent tracheal resection for tracheal stenosis with end-to-end anastomosis between January 2000 and December 2010. All patients were referred to our tertiary academic hospital with a tracheostomy tube in-situ. We included tracheal stenosis only in the cervical region. Data was compiled from the operating theatre registry and patients' operative notes. A total of 18 patients had undergone tracheal resection with end-to-end anastomosis for the above period of time. Eight cases were excluded from the study due to incomplete data. The demographic features including age, gender, the grade of tracheal stenosis, length, distance and type of stenosis, the presence of tracheomalacia and vocal cord palsy preoperatively were collected from the case notes. The etiology of tracheal stenosis, perioperative procedures pertaining to tracheal...
resection with anastomosis, surgical outcome and complications which had occurred were also recorded. The outcome measure for this analysis was taken as the number of patients successfully decannulated after the surgery. All nominal data were analyzed using frequency (number) and ratio (%). The numerical data were analyzed in the form of mean and median.

The grading of the tracheal stenosis is using the Cotton-Myer classification. Prior to tracheal resection with anastomosis, all patients underwent examination under anesthesia, with direct laryngotracheoscopy. The surgery was performed by the same team of surgeon in all cases. Tracheal resection with primary anastomosis was performed with the trachea skeletonized and then resected from the site of anastomosis until normal mucosa was identified. Post-operatively, all patients were nursed in the intensive care unit for 5 days and were given intravenous antibiotics. Intravenous corticosteroids were given 24 hours before extubation in all cases.

RESULTS
Out of 10 patients, 4 (40%) were male and 6 (60%) female. The age ranged from 15 to 53 years (mean 34.4). There were 6 (60%) cases of Grade III and and 4 (40%) cases of Grade IV stenosis. The distance of the stenosed segment from the vocal cords varied from minimum of 2.5 cm to a maximum of 4.0 cm, with median of 3.6 cm and mean distance of 3.4 cm. The length of the stenosed tracheal segment ranged from 0.5 cm to 3.4 cm. Two patients (18%) had tracheomalacia on direct laryngoscopy pre-operatively. Two other patients (18%) had vocal cord paresis pre-operatively. These two had external laryngeal trauma as the etiology of the tracheal stenosis.

Table 1. Preoperative Procedures.

<table>
<thead>
<tr>
<th>Number of procedures*</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>NIL</td>
<td>NIL</td>
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<tr>
<td>3</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>10</td>
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</tbody>
</table>

* Preoperative procedures which were performed after the initial examination

Four patients were well after tracheal resection without complications or the need of any intervention (Table 2). The most common complication in the other patients was granulation tissue in the anastomosis region (n=3), vocal cord paresis (n=2) and one restenosis (n=1) (Table 2). The 2 cases complicated by vocal cord paresis, resolved with conservative management. The remaining complications (n=4) were dealt with examination under anesthesia with removal and/or laser dilatation where necessary. However, 2 cases needed Shian Lee operation and required T-tube...
until present. The success rate for the tracheal resection with anastomosis was 80% (n=8), while 20% of patients (n=2) still require T-tube until present. However, these patients are frequently being assessed for trial of decannulation.

**DISCUSSION**

Tracheal stenosis remains as an iatrogenic complication following endotracheal intubation or tracheostomy. In our 11-year series, the most common etiology was post intubation injury. Post-intubation tracheal stenosis is a clinical problem caused by regional ischemic necrosis of the airway. Stenosis can occur anywhere from the level of the endotracheal tube tip up to the glottic and subglottic area, but the most common sites are where the endotracheal tube cuff has been in contact with the tracheal wall and at the tracheal stoma site after a tracheostomy procedure. Thus, tracheal stenosis can most commonly occur following the two types of airway intubation: endotracheal intubation and tracheostomy.

The postulated causative factor for stenosis is loss of regional blood flow due to pressure emitted through the cuff on the tracheal wall. Fortunately the advent of large volume, low pressure cuffs has markedly reduced the occurrence of cuff injury. Endoscopic techniques have been used in attempt to address post intubation tracheal stenosis, such as performing laser ablation, dilatation or stenting. However, only thin webline stenosis can be removed definitively by laser treatment and benefit in more extended lesions is temporary. In our series, only 4 patients underwent tracheal resection with anastomosis without any prior endoscopic intervention. Six patients had 1 to 4 endoscopic procedures (Table 1), which had short-term relief of airway obstruction. Repeated endoscopic procedures were necessary, and all these 6 patients eventually underwent resection with anastomosis. Previously, tracheal stenosis was managed with endoscopic procedures alone and success rate was defined when the patients were able to wean off from tracheostomy tubes. Recently, surgical resection and end to end anastomosis was considered the only definitive treatment for tracheal stenosis. Tracheal resection with primary anastomosis is associated with no or low (1.8%) mortality. Prior to the tracheal resection, frequent assessment of the tracheal stenosis following endoscopic procedures are needed, as decision for surgery can be made early if the grade or degree of stenosis remains after the endoscopic intervention. In our series, our success rate was 80%, which means that those patients were successfully decannulated after resection. However, 20% of our patients still required T-tube until present. Wain has reported a success rate of 93.7% and Marques et al. reported a 92% success rate, with no mortality.

**CONCLUSION**

Tracheal resection with end-to-end anastomosis was a safe procedure in management of tracheal stenosis. However, this procedure should be carried out by the trained surgical teams who can perform endoscopic and open airway surgeries with a good post operative nursing care by the intensivist.


