Há indicação para a realização da cirurgia de separação laringotraqueal para a prevenção de aspiração pulmonar em pacientes com tumores de cabeça e pescoço?

RESUMO

Objetivo: Avaliar os resultados obtidos em pacientes com câncer de cabeça e pescoço submetidos à extensas ressecções das vias aéreas e digestivas superiores associada à cirurgia de separação laringotraqueal (SLT). Esta tinha o objetivo de prevenir potencial aspiração pós-operatória. Desenho do Estudo: Análise retrospectiva. Estabelecimentos: Hospital das Clínicas da Universidade Federal de Minas Gerais (UFMG) e o Hospital Biocor. Método: Análise dos prontuários médicos de 30 pacientes com câncer de cabeça e pescoço, cuja exérese tem, sabidamente, grande potencial de causar aspiração pulmonar no pós-operatória. Eles foram submetidos à que se submeteram à realização da SLT juntamente com a ressecção do tumor, no período de 1991 a 2008. As seguintes variáveis foram avaliadas: prevenção de potencial e grave aspiração pulmonar pós-operatória, morbidade e taxa de reversibilidade da LTS. Resultados: A cirurgia foi eficaz em 100,0% dos casos. Seis (20,0%) pacientes tiveram complicações pós-operatórias, ou seja, edema, estenose de traqueostomia e fistula traqueocutânea do coto proximal da traqueia. A cirurgia para reversão LTS foi realizada em 11 (36,7%) pacientes, sendo eficaz em nove (81,8%); cinco (45,5%) tiveram complicações pós-operatórias. Conclusões: A SLT impediu a ocorrência de aspiração pulmonar pós-operatória em pacientes submetidos à extensas ressecções das vias aéreas e digestivas superiores. O procedimento é potencialmente reversível e tem uma alta taxa de eficácia. No entanto, a frequência de complicações para ambas LTS e, especialmente sua reversão, não pode ser negligenciada. Descritores: separação laringotraqueal, prevenção de aspiração pulmonar, câncer de cabeça e pescoço, deglutuição, desordens de deglutuição.

Descritores: Neoplasias de Cabeça e Pescoço; Deglutição; Transtornos de Deglutição.

INTRODUCTION

Surgical treatment of patients with advanced mouth tumors, usually, implies extensive resection of the upper aerodigestive tract (UADT) segments. Not infrequently, these patients develop pulmonary aspiration in the postoperative period, resulting in potentially fatal pulmonary complications. Moreover, other disadvantages may be

ABSTRACT

Objective: To evaluate the results obtained in patients with head and neck cancer undergoing extensive resections of upper aerodigestive tract associated with laryngotraheal separation (LTS) surgery. The latter had the objective of preventing potential postoperative aspiration. Study design: retrospective analysis. Setting: Clinical Hospital of the Federal University of Minas Gerais (UFMG) and Biocor hospital. Method: Thirty patients with head and neck tumors, whose resections has great potential to cause postoperatively pulmonary aspiration. They were submitted to resection of the tumor and the LTS. The following variables were evaluated: prevention of potential and severe pulmonary postoperative aspiration, morbidity and rate of LTS reversibility. Results: The surgery was effective in 100.0% of cases. Six (20.0%) patients had postoperative complications, namely edema, tracheostoma stenosis and tracheocutaneous fistula of the proximal tracheal stump. Surgery for LTS reversal was performed in 11 (36.7%) patients, being effective in nine (81.8%); five (45.5%) had postoperative complications. Conclusion: LTS prevented the occurrence of postoperative pulmonary aspiration in patients undergoing extensive resections of the upper aerodigestive tract. The procedure is potentially reversible and has a high efficacy rate. However, the frequency of complications for the LTS cannot to be neglected. Descritores: laryngotraheal separation, preventing pulmonary aspiration, head and neck cancer, deglutition, deglutition disorders.

Key words: Deglutition Disorders; Respiratory Aspiration; Deglutition.
highlighted: an increase in hospital permanence, a delay in starting radiotherapy and an increase in the cost of treatment.1,2

Total laryngectomy (TL) has classically been indicated in some patients undergoing the resection of advanced UADT tumors, such as: total glossectomy, resection of tongue base, pharyngolaryngectomy and partial laryngectomy in patients with low pulmonary reserve. In these situations, the objective is not to provide an adequate safety margin for the control of primary tumors, but a means to prevent potential postoperative aspiration. The TL eliminates any possibility of reversing the procedure (rehabilitation of laryngeal voice), besides presenting a potential risk for developing postoperative complications.3-5 The replacement of this procedure by another one that doesn’t compromise the oncologic principles of the tumoral resection besides being effective in preventing aspiration and being reversible would benefit these patients.

Several techniques were proposed to replace TL, such as: epiglottis flap sutured in arytenoids, glottic closure through laryngofissure, and subperichondreal cri-coidecomy.6 The glottic closure procedure was modified by Sasaki et al (1980)7 by the addition of a sternohyoid muscle flap to provide an additional layer of laryngeal closure. All these procedures have not been successful in controlling aspiration, besides being technically complex and altering the laryngeal anatomy, compromising its potential for reversibility. The vertical laryngoplasty was described by Biller et al (1983)8 for the prevention of aspiration in patients who required total glossectomy for advanced carcinoma of the tongue. This procedure permits retention of the larynx with the preservation of swallowing and speech.

Lindeman (1975)9 reported a procedure of tracheo-esophageal diversion and in the following year described variations of this procedure, which was called laryngotracheal separation (LTS)10. It results in the separation of the digestive and respiratory tracts, preserving at the same time both the motor and structural integrity as well as sensory innervations of the larynx, a fact that turns this procedure potentially reversible.10 LTS has become the standard procedure at many institutions, mainly because it is reliable, technically simple and presents low morbidity, also preserving the ability to swallow and enabling reversibility. However, it does not preserve vocal function. It has been indicated particularly in the treatment of clinically intractable aspiration.11,12 The main conditions that motivate more indication of the LTS are serious and degenerative neurological diseases.11,12

Chronic pulmonary aspiration is frequently observed in subjects with an altered anatomy of the UADT because of a tumor or its resection.1,2 In these cases, LTS is indicated for preventing the installation of pulmonary aspiration in the postoperative period. The use of LTS for potential postoperative aspiration prevention was first reported by Eibling et al (1995)11 (two patients) and subsequently by Lombard and Carrau (2001)14 (one patient). The latter proposed its use instead of TL in patients with pharyngolaryngeal tumors (supraglottic region, vallecula and tongue base).15 Thus, the LTS was indicated in patients that would be subject to a high risk of severe aspiration, especially those with a clinical status indicative of low tolerance for this complication. The purpose of this statement is to evaluate the results of LTS in 30 patients with head and neck tumors, who underwent extensive UADT resection.

OBJECTIVE

Evaluate LTS in 30 patients with head and neck tumors, who underwent the extensive resection of UADT segments regarding: prevention of postoperative pulmonary aspiration, morbidity and reversibility rate.

METHODS

Retrospective analysis of the hospital records of 30 patients with head and neck tumors, who underwent LTS in a period from 1991 to 2008 collected from two Brazilian institutions: the Clinical Hospital of the Federal University of Minas Gerais (UFMG) and the Biocor Hospital. All operations were performed by the same surgical team (members of head and neck surgery at the Clinical Hospital - UFMG). The study was approved by the Research Ethics Committee of UFMG (process nº. ETIC 080/03). Twenty patients were male and 10 female (male/female ratio was 2:1). The age ranged from 36 to 77 years, with an average of 52.4 ± 8.3 years and median of 56 years. The indication for the use of LTS was to prevent aspiration after extensive UADT resection.

All patients had advanced squamous-cell carcinoma in UADT segments. The locations of the tumors are shown in Table 1. Twenty-five (83.3%) patients were classified as stage IV and five (16.6%) classified as stage III. The classification used for tumor staging in patients with pharyngolaryngeal tumors was TNM (American Joint Committee on Cancer: Manual for Staging of Cancer. Philadelphia, JB Lippincott, 1992).

The operations performed for the resection of a primary tumor are listed in Table 2. In all cases, except one, bilateral neck dissection was also performed. In 16 (53.3%) patients, we used the flap of the pectoralis major muscle for reconstruction of the surgical defect. The other patients (46.7%) did not require the rotation flap to close the wound. LTS was performed during surgery resection of the primary tumor. It had the objective of preventing potential postoperative aspiration. Radiotherapy was used in all patients in the postoperative period. No patient had a tracheostomy or had a previous tracheostomy scar at the time of the LTS procedure. Also, no patient died during the early postoperative period.

Infection of the surgical site was not considered as a complication of LTS. This is because the patients were submitted to LTS during resection of the primary tumor (contaminated operations); a fact that did not permit a
One patient had a surgical site infection associated with the wound dehiscence related to resection of primary tumor. The dehiscence was treated by a rotation flap of the pectoralis major muscle and the surgical site infection treated with antibiotics for 14 days. It was not possible to establish a surgical site infection as a complication of LTS. The reversal of LTS was performed in 11 (36.7%) patients. The mean maintenance of LTS to reversal was 16.7 months. In the other two (18.2%) patients, it was ineffective and resulted in the development of tracheal stenosis at the suture line, treated with tracheostomy (one patient), and severe and clinically intractable aspiration with subsequent progression to tracheal stenosis at the suture line, which was treated with a TL (one patient). Five (45.5%) of the eleven patients showed postoperative complications, including mild to moderate aspiration (transient), which was overcome by compensatory mechanisms (three patients).

**DISCUSSION**

Patients with head and neck tumors who are submitted to extensive resection of the UADT segments show a higher risk of developing severe aspiration during the postoperative period. This fact can be more important in patients with low pulmonary reserve. These patients may benefit from a procedure that prevents aspiration and that is potentially reversible. Opinions are divided over the validity of total glossectomy without associated TL for advanced carcinoma of the tongue. Total glossectomy without TL should only be undertaken in motivated and well supported patients able to accomplish the difficult rehabilitation process. The total glossectomy with laryngeal preservation in properly selected patients provides local and regional control and preserves the quality of life, as demonstrated by Tiwari et al. (1993). The use of LTS in order to prevent potential aspiration postoperative was first reported by Eibling et al. (1995), with LTS being effective in preventing aspiration in both patients. Later, Lombard and Carrau (2001) proposed its use in a patient instead of TL with intent to prevent aspiration. This patient had a pharyngolaryngeal tumor (supraglottic region, vallecula and tongue base). The LTS procedure was effective in preventing postoperative aspira-

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**Table 1.** Location of squamous cell carcinomas of patients undergoing laryngotraheal separation (n = 30).

<table>
<thead>
<tr>
<th>Tumor location</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base of tongue, with extension to the vallecula and/or tonsillar pillar</td>
<td>12</td>
<td>40.0</td>
</tr>
<tr>
<td>Floor of the mouth extending to tongue</td>
<td>8</td>
<td>26.7</td>
</tr>
<tr>
<td>Supraglottic larynx</td>
<td>5</td>
<td>16.6</td>
</tr>
<tr>
<td>Amygdala extending to the tongue and floor of the mouth</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Floor of the mouth extending to jaw</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Hypopharynx</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Table 2.** Operations performed for resection of primary tumor in patients undergoing laryngotraheal separation (n = 30).

<table>
<thead>
<tr>
<th>Type of operation</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive resection of the mouth with total or partial glossectomy</td>
<td>9</td>
<td>30.0</td>
</tr>
<tr>
<td>Resection of the mouth and tongue associated with mandibullectomy</td>
<td>8</td>
<td>26.7</td>
</tr>
<tr>
<td>Total or partial glossectomy associated with supraglottic laryngectomy</td>
<td>7</td>
<td>23.3</td>
</tr>
<tr>
<td>Supraglottic laryngectomy</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>Supracricoid laryngectomy with cricohiodopexia</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Supraglottic pharyngolaryngectomy</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100.0</td>
</tr>
</tbody>
</table>
piration in all patients. LTS has been indicated in these circumstances because it is effective in preventing aspiration, is potentially reversible, and can be performed during the same surgical intervention.

LTS was performed in 30 patients with the aim of preventing potential postoperative aspiration, resulting from extensive resection of UADT segments. The series presented is expressive, especially when faced with a shortage of publications on the subject and the small number of patients in other previously reported series. The LTS procedure is technically simple to perform and represents a technical variation of the tracheoesophageal diversion. The surgical technique of LTS, originally described by Lindeman et al (1976), recommend closure of the proximal tracheal stump in the anteroposterior direction. Side-to-side suture of the proximal tracheal stump represents a variation of the original technique that was used in all patients of the present series. The time taken to perform the LTS surgery has not been evaluated in our research because most of the operative reports did not record this information.

The present results showed a total efficacy (100.0%) in preventing pulmonary aspiration. Other investigators also reported expressive rates of efficacy with LTS. However, it should be noted that most patients in those series underwent LTS with the purpose of treating already installed pulmonary aspiration and not its prevention.

Six (20.0%) patients developed postoperative complications. Those that were considered less serious were treated successfully, conservatively. The major complications were tracheocutaneous fistula of the proximal tracheal stump and tracheostomal stenosis. This complication has also been reported in other studies, being observed in in 38.0% in the study of Eibling et al (1995), in 21.2% of patients in the series of Zocratto et al (2012) and in 22.0% in the series of Yamana et al (2001). Francis et al (2012) suggests the use of a muscle flap-reinforced closure of the proximal tracheal stump after LTS surgery that would allow a low incidence of postoperative fistula formation.

The tracheocutaneous fistula can often result in LTS failure, requiring surgical treatment in some cases. The possibility of using diet orally without aspiration is related to the effectiveness of LTS. The oral diet was not possible in seven (23.3%) cases because of the great extension of the resections performed. Some patients had already been on an enteral diet before the operation because of the nature of the base disease, which did not permit oral feeding, a fact also previously reported. Patients who are intolerant to a diet by natural means are nourished by the enteral route, primarily through the nasoenteral catheter, and less frequently by gastrostomy. Many clinicians and surgeons have adopted, at first, gastrostomy for nutrition in patients with aspiration. With the use of LTS for aspiration treatment, gastrostomy is reserved for a small number of patients.

The main disadvantage of LTS refers to loss of the larynx function, which eliminates the ability to speak, either temporarily or permanently. However, this characteristic is common to all procedures that separate the digestive and respiratory tracts. Another restriction for LTS refers to the possible harmful effects (squamous metaplasia and/or reabsorption of the tracheal cartilage) of food and secretions accumulated in the blind fund arising from the subglottic tracheal proximal stump suture. This, however, does not seem to be relevant because, until now, there is no record of late complications, such as infections, arising from this fact. The potential risk of complications caused by pooling in the tracheal blind pouch in laryngotracheal separation is prevented presumably due to the slow but continuous turnover of pooling material.

LTS results in the separation of the digestive and respiratory tracts, preserving at the same time the integrity of both the structural integrity and motor and sensory innervations of the larynx; a fact that makes this procedure potentially reversible, as reported by other authors. In the present study, eleven (36.7%) patients were submitted to LTS reversal. The criteria used for the decision to reverse were mainly based on the clinical assessment of the patient (recovery of nutritional status, adaptation to the new conditions of swallowing after extensive resection of UADT segments, absence of pulmonary complications and motivation of the patient for a new surgery). The possibility of LTS reversal is evaluated after complete postoperative recovery and post-radiotherapy of the patient. This occurs about three to six months after the operation when the clinical conditions of the patients are most often much more favorable. At this moment, the patient is already recovered from a nutritional standpoint and adapted to the new conditions for swallowing. In the series under study, the average time between the LTS to the reversal surgery was 14.2 months.

The success of reversal (tracheal re-anastomosis of the stumps) is achieved with the restoration of the physiological airway and satisfactory laryngeal function (ability to feed orally without aspiration and the restoration of intelligible speech). The patients whose reversion surgery is effective usually maintain oral feeding and comprehensible speech for an indefinite period of time. However, the frequency of complications and inefficacy of LTS reversal should not be overlooked. The success rate in the series under study was 76.7%. However, the complication rate was high (45.5%). This fact is similar to previous studies described in the literature. The 11 patients who underwent reversal of LTS were accompanied with specialist speech therapy for rehabilitation of laryngeal voice, once the completion of the LTS does not interfere with the structural integrity (anatomical) of the larynx. In the remaining 19 patients, the persistence of LTS prevented the laryngeal vocal rehabilitation, given the fact that the larynx remained defunctionalized. In such cases, the vocal rehabilitation was proceeded in the same manner as in laryngectomized patient.

The introduction of the diet by mouth can be done in the first days after surgical reversal. However, some
patients may present mild to moderate post-prandial aspiration, which can be overcome by compensatory mechanisms. It allows the restoration of oral feeding over a period of weeks to months. However, the reversal may be ineffective and result, mainly, from the development of tracheal stenosis at the suture line, a fact which occurred in two (18.2%) of the 11 patients. Despite the advantage of LTS reversion, it should not be indicated because this background but because it prevents the pulmonary aspiration.6,21

CONCLUSION

LTS surgery is effective in preventing pulmonary aspiration in patients undergoing extensive resections of UADT segments. It can be indicated as an alternative to TL. LTS is more advantageous because of its potential reversibility. However, the frequency of complications for both LTS and, especially, its reversion operation cannot be neglected.

REFERENCES