Management of Difficult Laryngeal Exposure During Suspension Microlaryngoscopy

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Abstract Difficult laryngeal exposure during suspension microlaryngoscopic surgeries is a common situation encountered by the phonosurgeons nowadays. It leads to unnecessary trauma, incomplete surgery and even abortion of the procedure. Although various methods have been described to counter the situation, they might not be adequate in some cases with very anteriorly placed larynx. This study is intended to determine the utility of angled rigid endoscope along with malleable endoscopic instruments to improve surgical access in cases with inadequate glottic exposure during suspension microlaryngoscopy. In this cross sectional study conducted at Lokmanya Tilak Municipal Medical College and General Hospital in Mumbai, 50 patients of voice disorders who underwent Suspension Microlaryngoscopy from July 2014 to December 2017 were included. Out of these patients, 5 patients (10%) presented with difficult laryngeal exposure that were operated using readily available angled rigid endoscope along with malleable endoscopic instruments, without requirement of any specially designed instruments. There was improvement in laryngeal exposure in all the cases following utilisation of angled endoscopes. The surgeries were carried out under video monitor guidance with complete excision of the vocal cord lesions. Our study concluded that the cases in which the laryngeal exposure cannot be improved even by various external procedures, can be enhanced by application of angled rigid endoscopes

and the vocal cord lesions can be excised completely by using malleable endoscopic instruments.

Keywords Difficult laryngeal exposure · Angled endoscopes · Management of difficult laryngeal exposure · Suspension microlaryngoscopy · DLE · Anterior vocal cord lesions

Introduction

An adequate laryngeal exposure is an essential prerequisite for an effective transoral microlaryngeal surgery. In most cases, the placement of a suspension laryngoscope transorally achieves adequate visualisation of the glottis. However, it is difficult to visualise the glottic structures, especially the anterior commissure completely in certain cases. These situations, referred to as Difficult Laryngeal Exposure (DLE), when encountered, result in unnecessary trauma, incomplete surgery and even abortion of the procedure [1]. To counter this problem, various methods and techniques, such as head elevation [2], external laryngeal pressure, flexible fibre-scope [3, 4], curved laryngoscope [5–7], and video-assisted rigid endoscope [8, 9] have been employed. These methods have managed to counter the problem of DLE to a certain degree. However, these methods can be inadequate in severe DLE [10] or they require sophisticated equipment, not routinely available in the Operating Rooms (OR).

We have devised a simple technique, using routine equipment to counter this problem. In this article, we discuss the utility of a rigid angled sinus endoscope along with microlaryngeal instruments with malleable tips to improve the visualisation of the glottic structures and conduct a

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complete surgery in cases that presented with severe DLE not correctable by external laryngeal manipulation.

Aims and Objectives

To determine the utility of angled rigid endoscope along with malleable microlaryngeal instruments to improve surgical access in severe DLE cases.

Materials and Methods

In this cross sectional type of study, 50 patients of voice disorders who underwent Suspension Microlaryngoscopy (SML) in our tertiary care centre between July 2014 and December 2017 were included. Kleinsasser microlaryngoscope was inserted transorally with the patient placed in the Boyce's position (flexion at atlanto-axial and extension at atlanto-occipital joint). Grading of laryngeal exposure on suspension laryngoscopy was done as Grades I to IV (Roh and Lee) [11]. The "Difficult Laryngeal Exposure" (DLE) was defined as the cases in which the laryngeal exposure was grade IIB, III OR IV using the standard technique. In these cases adequate laryngeal exposure could not be obtained even with external manipulations like head elevation and external counter pressure.

Among the 50 patients undergoing SML in our institute, five cases (10%) were identified as DLE, of which three were males and two were females. The diagnosis included vocal cord polyp in three patients, cyst in one patient and nodule in one patient. These patients were operated upon by using angled rigid sinus endoscope along with malleable microlaryngeal instruments.

Surgical Procedure

Patients were administered general anaesthesia via orotracheal intubation along with muscle relaxant. During the procedure, the patient was placed in a Jackson-Boyce's sniffing position with extension of the head along with flexion of the neck. Then, the direct Kleinsasser laryngoscope was introduced transorally and the larynx was suspended and the extent of laryngeal exposure was evaluated.

The laryngeal exposure under SML and angled rigid endoscope was evaluated and compared by using modified Cormack-Lehane score (Roh and Lee study) as mentioned: grade 1, full view of the vocal folds; grade 2A, partial view of the vocal folds, but the anterior commissure not seen; grade 2B, partial view of the vocal folds (less than half); grade 3, only the arytenoids visible; and grade 4, the entire glottis and arytenoids hidden [11].

In the cases where adequate exposure was not possible, head elevation and external counter pressure was applied to

improve the visualisation of the glottic structures. However, if the exposure was still not adequate to perform the surgery (in Grade IIB, III and Grade IV laryngeal exposure), then Kleinsasser laryngoscope was removed and Macintosh laryngoscope was introduced transorally, with the tip of the blade resting in the vallecula and an attempt was made to expose the glottic structures to the maximum extent. Then, an angled rigid endoscope (45° or 70°) was passed perorally and the glottic plane comprising the lesion was completely visualised on a high definition monitor with the assistance of an endoscopic video camera system which was attached to the scope. With the Macintosh laryngoscope being supported by an assistant, the operating surgeon introduced the malleable microlaryngeal instruments to manipulate and surgically excise the vocal cord lesions. If necessary, the assistant supported the laryngoscope and the angled rigid sinus endoscope, thereby allowing the main surgeon to bimanually carry out the surgery under high definition video monitor guidance.

Results

The comparison of the laryngeal exposure under SML and angled rigid endoscope is depicted in Table 1. In three patients of DLE, only arytenoids area was exposed and in the other two patients, less than half of the vocal cords were seen under conventional SML. There was a significant improvement in the laryngeal exposure with the

Table 1 Clinical features of patients and grades of laryngeal exposure

Case no.	Age/sex	Diagnosis	Exposure grade under suspension microlaryngoscopy ^a	Exposure grade using angled endoscope ^a
1	51/M	Vocal cord polyp	3	1
2	44/M	Vocal cord polyp	3	1
3	63/M	Vocal cord cyst	2B	1
4	31/F	Vocal cord polyp	3	1
5	28/F	Vocal cord nodule	2B	1

^aGrading of laryngeal exposure: grade 1, full view of the vocal folds; grade 2A, partial view of the vocal folds, but the anterior commissure not seen; grade 2B, partial view of the vocal folds (less than half); grade 3, only the arytenoids visible; and grade 4, the entire glottis and arytenoids hidden. (Roh and Lee classification)

Fig. 1 **a** Laryngeal exposure with the conventional suspension laryngoscope, showing only the arytenoids microscopically (grade 3 laryngeal exposure). **b** Microlaryngeal instruments with malleable tips that can be set at required angle to deal with vocal cord lesions in DLE cases

Fig. 2 **a** The surgeon performing the procedure bimanually using malleable instruments under video monitor guidance. **b** The assistant holding the angled endoscope in right hand and Macintosh laryngoscope in the left hand

application of angled rigid sinus endoscope when compared to the direct suspension laryngoscope. All the patients were operated with complete removal of the vocal cord lesions as optimal laryngeal exposure could be obtained by the rigid angled sinus endoscope. There were no post operative complications in any of the patients.

A representative case (Case no. 1) is described in detail below. A 51 year old male presented to our outpatient department with complaints of change in voice since 8 months. A direct rigid laryngoscopy was done and he was diagnosed to have left vocal cord polyp. The laryngeal exposure on direct suspension laryngoscopy showed only the arytenoids (Fig. 1a). There was no significant improvement in the visualisation of the laryngeal structures following change in head position and external counter pressure. Therefore, Kleinsasser laryngoscope was removed and Macintosh laryngoscope was introduced transorally (Fig. 2a). The angled rigid endoscope was

passed perorally that provided better laryngeal exposure (Fig. 2b) and the vocal cord lesion was adequately visualised and completely excised (Fig. 3) with the aid of malleable microlaryngeal instruments (Fig. 1b).

Discussion

The incidence of DLE is reported to range from 1.5 to 24% [12]. Even though, the exposure of larynx is adequate in most cases, inadequate laryngeal exposure remains the major cause for abortion of surgery during suspension laryngoscopy [1].

The procedure of suspension microlaryngoscopy relies on the achievement of a direct 'line-of-sight' for adequate exposure of the glottis by alignment of the oral, pharyngeal, and laryngeal axes [13]. Since the anatomy of the oral cavity and the pharynx is naturally curved, a laryngoscope

Fig. 3 Laryngeal exposure with angled endoscope. The glottis was completely visualised including anterior commissure as grade 1 laryngeal exposure (a). The vocal cord polyp was grasped using the malleable forceps and removed (b, c). The vocal cord polyp was completely excised (d)

used in suspension laryngoscopy reflecting this anatomy should be accordingly curved. Various advances in this aspect, resulted in development of some curved laryngoscopes, including rigid curved laryngoscope or GlideScopeVR videolaryngoscope, that were previously reported to provide good visualization for DLE patients, but they all had certain limitations [5–7]. The most common limitations included narrow working space, low image resolution and magnification, and difficulty in using the Carbon dioxide laser systems.

In order to overcome these limitations, we used angled rigid endoscope along with malleable microlaryngeal instruments to deal with DLE cases. We had managed to successfully complete the surgeries of all the cases encountered with DLE in our study. The major advantages are the low cost, adequate working space and the availability of high definition video enabling precise monitor guidance during the procedure. All the equipment required to deal with DLE cases by this method are readily available in the OR, thereby avoiding the abortion of the procedure. It also does not require any expensive specially designed equipment like a GlideScopeVR or an Airtraq laryngoscope [14]. The malleable microlaryngeal instruments can be adjusted to various angles as per the requirements of every individual case.

However, there are certain limitations with our method; such as inability to use the CO₂ laser, and the need for an assistant to hold the laryngoscope and endoscope while the surgeon uses both the hands.

Conclusions

Difficult laryngeal exposure in phonosurgery using direct suspension laryngoscopy is inevitable in some patients. Our study showed that when the laryngeal exposure in cases that cannot be improved even by various external procedures, can be enhanced by application of angled rigid endoscopes, and the vocal cord lesions can be excised completely.

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