臨床耳鼻：第 25 卷　第 2 號　2014
J Clinical Otolaryngol 2014;25:271-275

Fiberoptic Laryngeal Microsurgery in Patients with Cervical Spine Disease

Jeon Yeob Jang, MD[1], Hyo Sung Kim, MD[2], Ji Seok Baik, MD[2] and Hae Kyu Kim, MD[2]

[1]Department of Otorhinolaryngology-Head and Neck Surgery; [2]Anesthesia and Pain Medicine, Pusan National University Hospital, Pusan National University School of Medicine, Busan, Korea

－ ABSTRACT －

Laryngeal microsurgery using suspension laryngoscope is a common procedure for benign laryngeal lesions. However, suspension laryngoscope could not always guarantee adequate exposure of the vocal cord in patients having stiff neck. Here we present a novel operative method to overcome difficult laryngeal exposure in patients with cervical spine diseases. A 71-year-old man presented with hoarseness. Laryngeal evaluation showed a vocal polyp located at the anterior portion of right true vocal cord. He previously underwent partial laminectomy of cervical and thoracic vertebrae for ossified ligamentum flavum. During operation, suspension rigid laryngoscope was not able to be introduced at the true vocal cord level due to a limited neck extension caused by spine immobilization and further concern was taken for potential damage of spinal cord. We performed fiberoptic laryngeal microsurgery assisted with McGRATH® portable video laryngoscope and successfully removed the vocal polyp. Fiberoptic laryngeal microsurgery assisted with McGRATH® portable video laryngoscope might be an alternative approach in selected patients of difficult laryngeal exposure especially due to cervical spine disease. **(J Clinical Otolaryngol 2014;25:271-275)**

KEY WORDS : Fiberoptic laryngeal microsurgery · Video laryngoscope · McGRATH® · Difficult laryngeal exposure · Spine disease.

Introduction

Laryngeal microsurgery using suspension laryngoscope is a universal procedure for benign laryngeal lesions as well as for laryngeal neoplasms. However, laryngeal exposure, especially anterior portion of true vocal cord, is sometimes very difficult due to several reasons such as individual anatomic variations, obesity and previous radiation therapy.[1-3] Of these, cervical spine disease is one of the most troublesome causes of difficult laryngeal exposure under suspension laryngoscope. It not only limits adequate neck extension but also elicits further concern for potential damage to cervical spinal cord during the operative procedure. Thus, alternative surgical approach is required. Here we report our recent experience regarding the use of fiberoptic laryngeal surgery guided by McGRATH® portable video laryngoscope (Aircraft Medical, Edinburgh, Scotland, United Kingdom) in patients with cervical spine disease and discuss its potential value and indications.

논문접수일 : 2014년　9월 29일
논문수정일 : 2014년 10월　7일
심사완료일 : 2014년 11월 20일
교신저자 : 김해규, 602-739 부산광역시 서구 구덕로 179
부산대학교 의과대학 부산대학교병원 마취통증의학과
전화 : (051) 240-7397 · 전송 : (051) 246-7466
E-mail : Hakykim@pusan.ac.kr

Case Report

A 71-year-old man was presented with hoarseness. He did not present any other symptoms such as sore throat, dyspnea and cough. He had previously undergone radiation therapy for early-stage glottic cancer at 12-years-ago and showed no evidence of recurrence during regular follow-up examination. Laryngeal ex-

amination revealed that a polypoid mucosal lesion located at the anterior portion of right true vocal cord (Fig. 1). Bilateral vocal cord was well mobile and there was no other mucosal lesion at the larynx and hypopharynx. Past medical history revealed that he had previously undergone partial laminectomy of cervical and thoracic vertebrae for ossified ligamentum flavum causing spinal cord compression (Fig. 2). He still suffered from paresthesia and tingling sensation of extremities with ongoing conservative management.

Conservative management including voice therapy was performed for the probably benign vocal polyp during 3 months. However, the size of the vocal polyp was rather increased at the follow-up examination and subjective symptom was aggravated. We decided to perform laryngeal microsurgery under general anesthesia to remove vocal polyp and to perform pathologic evaluation.

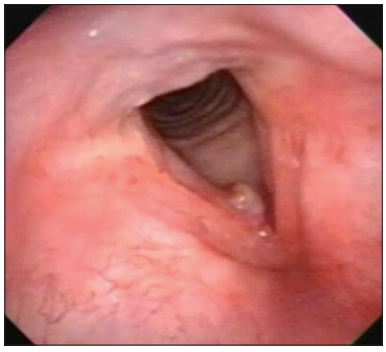

Fig. 1. Preoperative laryngeal finding demonstrating vocal polyp located at the anterior portion of right vocal cord.

Assessment of the patient's airway identified a short neck, reasonable mouth opening and limited neck extension caused by spine immobilization. The patient was positioned with his head on a pillow and was applied routine monitors consisted of a pulse oxymeter, 3-lead electrocardiography and non-invasive blood pressure cuff. Anesthesia was induced with propofol, desflurane, and remifentanil. After adequate manual ventilation, rocuronium was administered to facilitate endotracheal intubation. Ventilation was started with oxygen and medical air (F_iO_2=0.6). The bispectral index (BIS)(A-2000 BIS™ monitor; Aspect® Medical Systems Inc., Natick, MA, USA) was also monitored. Anesthetist performed endotracheal intubation using the McGRATH® portable video laryngoscope. Anesthetist could not see the glottis but only epiglottis (Cormack and Lehane Grade III) with the naked eye. However, we could see not only the vocal cord but also a vocal polyp through the video monitor. Orotracheal intubation was then carefully performed using a reinforced endotracheal tube (internal diameter : 5.5) with hockey stick shaped stylet because the view of glottis

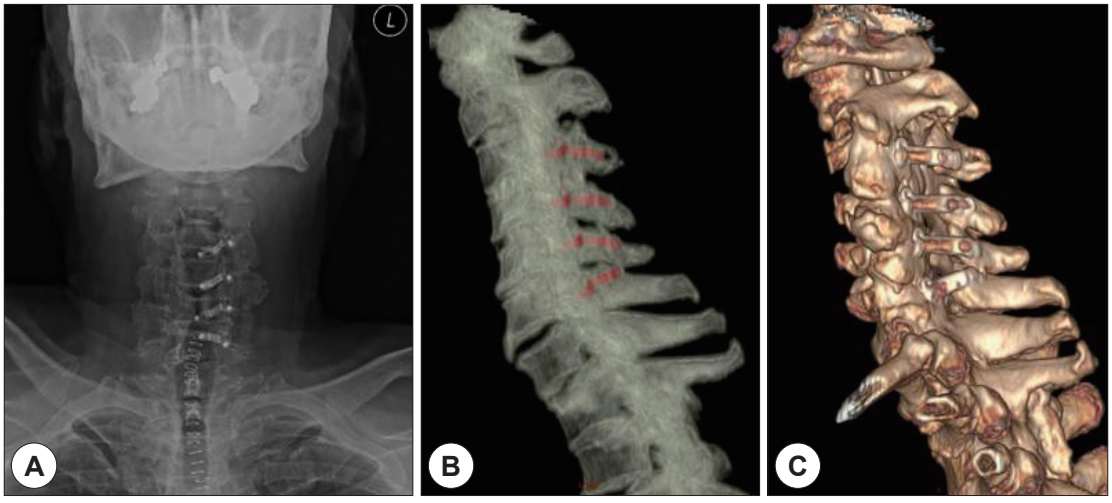

Fig. 2. Radiologic images demonstrating cervical spine disease. A : Neck Soft tissue X-ray. B and C : Three-dimensional reconstructed images of cervical spine.

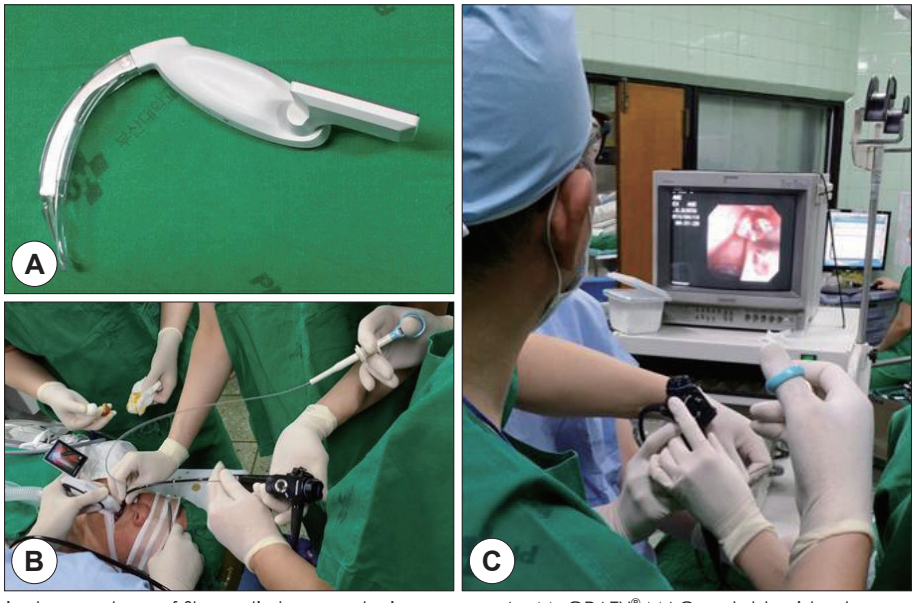

Fig. 3. Surgical procedures of fiberoptic laryngeal microsurgery. A : McGRATH® MAC portable video laryngoscope. B : Operative procedures of fiberoptic laryngeal surgery. C : Operative procedures were performed under fiberoptic endoscope-connected monitoring system.

is indirect. Despite of successful endotracheal intubation, a conventional suspension laryngoscope was not able to be introduced at the true vocal cord level intraoperatively due to a limited neck extension caused by spine immobilization and further concern was taken for potential damage of spinal cord. Therefore, we decided to perform laryngeal microsurgery using flexible fiberoptic endoscope instead of using suspension rigid laryngoscope.

Firstly, McGRATH® portable video laryngoscope (Aircraft Medical, Edinburgh, Scotland, United Kingdom) was introduced and was forced inferiorly to depress tongue base (Fig. 3). The type of laryngoscope-blade was translucent hence to preserve visual field of airway architecture. One assistant was holding the laryngoscope throughout the operative procedure to expose upper airway without neck extension. Then, flexible fiberoptic endoscope was introduced through exposed patient's airway to visualize true vocal cord including anterior commissure through a monitoring system. The vocal polyp at the anterior portion of right vocal cord was removed through repeated manipulation of combining forceps inserted within the fiberoptic endoscope (Fig. 4). Intraoperative bleeding control was achieved through gentle compression of gauze ball grasped with combining forceps. The operative procedure was completed after identifying complete removal of polyp without damaging intact mucosa.

Postoperative laryngeal evaluation at outpatient clinic showed complete removal of polypoid lesion without damaging true vocal cord mucosa. Final pathologic report indicated the removed lesion was a vocal polyp with no evidence of malignancy. The patient recovered from hoarseness and no other symptom related with cervical spine myelopathy was notified after surgery.

Discussion

Laryngeal microsurgery or endotracheal intubation in patients with difficult laryngeal exposure has long been concerns of laryngologists and anesthesiologists. Hence, several analyses to predict difficult laryngeal exposure and operative methods to overcome these problems have been introduced before.[2-6] For exam-

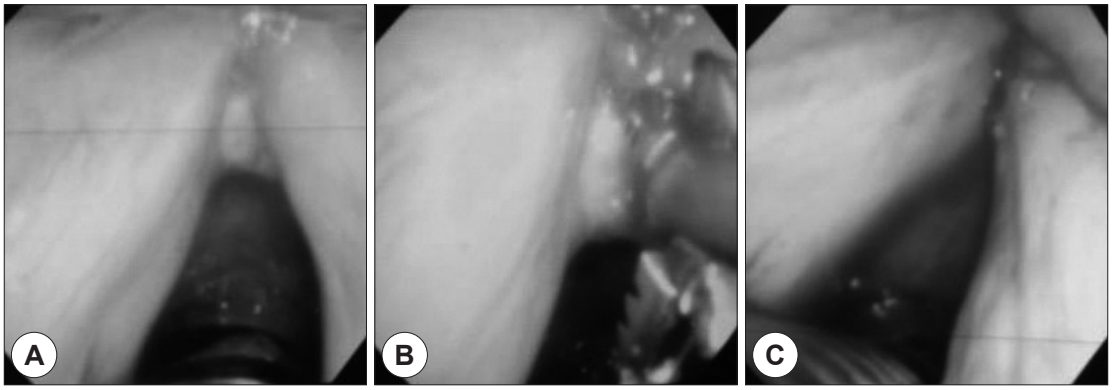

Fig. 4. Intraoperative laryngeal findings. A : Visualization of anterior portion of vocal cord though flexible fiberoptic endoscope. B : Removal of vocal polyp by using combining grasping forceps. C : Identifying the complete removal of vocal polyp.

ple, Kim et al. developed the curved type rigid laryngoscope with a curvature of 70° to fit the curvature from the base of tongue to the larynx.[6] This surgical approach may provide better laryngeal visualization and less traumatic manipulation in patients with difficult laryngeal exposure. However, it requires special instrumentation which is hard to be achieved generally. Despite of these efforts, it remains still under discussion to overcome difficult laryngeal exposure due to various kinds of causes and thus, personalized approach is required for adequate surgical outcome as well as cost-effectiveness.[1]

The use of flexible fiberoptic endoscope in difficult airway was initially had attention in the field of anesthesiology.[7] Fiberoptic endoscope was known to facilitate tracheal intubation even without neck extension compared with conventional method, and it is now generally considered as a reliable alternative method of endotracheal intubation for patients who have anticipated difficult airways especially caused by cervical spine immobilization.[8] However, we used portable video laryngoscope instead of the flexible fiberoptic endoscope to intubate an endotracheal tube (ETT) at this case. The important reason of using the video laryngoscope is to prevent injury of laryngeal polyp. While an advancement of endotracheal tube during fiberoptic intubation could not be seen, the advancement during endotracheal intubation using the portable video laryngoscope could be seen through video monitoring system. Thus, the anesthetist could avoid injury of laryngeal polyp during endotracheal intubation with help of video monitoring system.

The use of McGRATH® in patients with difficulty airway, failed tracheal intubation and severe ankylosing spondylitis for awaked intubation were already reported.[9,10] Futhermore, A.M. Taylor et al. was reported that endotracheal intubation was successful in all patients using the McGRATH®, while the Macintosh was successful in 59% patients at his randomized, controlled trial.[11] Firstly, the reason account for these difficulties is that during direct laryngoscopy, a straight line of vision is formed by aligning oral, pharyngeal and laryngeal axes, allowing passage of the tracheal tube in a straight line. While using the McGrath® video laryngoscope, these axes are not aligned, therefore pass around a relatively acute angle to enter the larynx.[12] Also, a wider view is transmitted to the monitor because the viewpoint is closer to the target using the videolaryngoscope.[13]

The use of flexible fiberoptic endoscope was also reported for laryngeal surgery.[14,15] They demonstrated the application of fiberoptic laryngeal surgery under topical anesthesia and claimed that it enabled precise laryngeal surgery in outpatient clinic. Indeed, it appears beneficial in selected cases such as recurrent vocal process granuloma.[15] However, concern was also taken

regarding gag reflex during the procedure and potential risk of bleeding and asphyxia.

The major difference of our fiberoptic laryngeal surgery compared with previously reported method was the type of anesthesia. Actually, under general anesthesia, the collapse of the pharyngeal and laryngeal structure makes fiberoptic visualization more difficult. Therefore, an assistant is required to facilitate laryngeal exposure by using portable video laryngoscope. Furthermore, transparent laryngoscope-blade which was adopted in McGRATH® portable video laryngoscope is helpful in preserving visual field of upper airway. Thus we demonstrate that fiberoptic laryngeal surgery is possible in a general anesthesia setting by using portable video laryngoscope, which leads to be free from the considerations regarding gag reflex and risk of asphyxia due to airway bleeding.

Despite of these potential values, surgery using combining grasping forceps in flexible fiberoptic endoscope limits precise manipulation of the instruments compared with the method using conventional suspension laryngoscope. Also, in our case, tiny fragment of the vocal polyp was still remained after surgery. Therefore, our method might only be used as an alternative approach in cases which the conventional method fails to expose larynx.

In conclusion, we demonstrate a case of fiberoptic laryngeal microsurgery under general anesthesia by using McGRATH® portable video laryngoscope. Despite of a limitation regarding less precise manipulation of instruments, it might be a potential alternative approach in selected patients of difficult laryngeal exposure especially due to cervical spine disease.

The authors thank Soo-Geun Wang M.D., Ph.D., Department of Otorhinolaryngology-Head and Neck Surgery, Pusan National University Hospital, Pusan National University School of Medicine, Busan, Korea for his insightful comments.

REFERENCE

1) Ohno S, Hirano S, Tateya I, Kojima T, Ito J. *Management of vocal fold lesions in difficult laryngeal exposure patients in phonomicrosurgery. Auris Nasus Larynx 2011;38(3):373-80.*
2) Pinar E, Calli C, Oncel S, Selek B, Tatar B. *Preoperative clinical prediction of difficult laryngeal exposure in suspension laryngoscopy. Eur Arch Otorhinolaryngol 2009; 266(5):699-703.*
3) Hsiung MW, Pai L, Kang BH, Wang BL, Wong CS, Wang HW. *Clinical predictors of difficult laryngeal exposure. Laryngoscope 2004;114(2):358-63.*
4) Kawaida M, Fukuda H, Kohno N. *Video-assisted rigid endoscopic laryngosurgery: application to cases with difficult laryngeal exposure. J Voice 2001;15(2):305-12.*
5) Levitan RM, Mechem CC, Ochroch EA, Shofer FS, Hollander JE. *Head-elevated laryngoscopy position: improving laryngeal exposure during laryngoscopy by increasing head elevation. Ann Emerg Med 2003;41(3):322-30.*
6) Kim JK, Jeong HS, Kwon HN. *A new curved rigid laryngoscope to overcome the difficult laryngeal exposure (DLE) in endolaryngeal surgery. Eur Arch Otorhinolaryngol 2007; 264(8):901-5.*
7) Messeter KH, Pettersson KI. *Endotracheal intubation with the fibre-optic bronchoscope. Anaesthesia 1980;35(3):294-8.*
8) Smith CE, Pinchak AB, Sidhu TS, Radesic BP, Pinchak AC, Hagen JF. *Evaluation of tracheal intubation difficulty in patients with cervical spine immobilization: fiberoptic (Wu-Scope) versus conventional laryngoscopy. Anesthesiology 1999;91(5):1253-9.*
9) Shippey B, Ray D, McKeown D. *Use of the McGrath® videolaryngoscope in the management of difficult and failed tracheal intubation. Br J Anaesth 2008;100(1):116-9.*
10) Uslu B, Nielsen RD, Kristensen BB. *McGrath® videolaryngoscope for awake tracheal intubation in a patient with severe ankylosing spondylitis. Br J Anaesth 2010;104(1):118-9.*
11) Taylor A, Peck M, Launcelott S, Hung O, Law J, MacQuarrie K, *et al. The McGrath® Series 5 videolaryngoscope vs the Macintosh laryngoscope: a randomised, controlled trial in patients with a simulated difficult airway. Anaesthesia 2013;68(2):142-7.*
12) Shippey B, Ray D, McKeown D. *Case series: the McGrath® videolaryngoscope: an initial clinical evaluation. Can J Anaesth 2007;54(4):307-13.*
13) Kaplan MB, Hagberg CA, Ward DS, Brambrink A, Chhibber AK, Heidegger T, *et al. Comparison of direct and video-assisted views of the larynx during routine intubation. J Clin Anesth 2006;18(5):357-62.*
14) Omori K, Shinohara K, Tsuji T, Kojima H. *Videoendoscopic laryngeal surgery. Ann Otol Rhinol Laryngol 2000;109(2): 149-55.*
15) Hirano S, Kojima H, Tateya I, Ito J. *Fiberoptic laryngeal surgery for vocal process granuloma. Ann Otol Rhinol Laryngol 2002;111(9):789-93.*