Case Report

A Case of Successful Direct Swallowing Therapy by Head Rotation for Postoperative Bilateral Recurrent Laryngeal Nerve Paralysis Following Thoracic Aortic Aneurysm

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Abstract: Paralysis of the recurrent laryngeal nerve (RLN) can cause hoarseness and dysphagia, but unilateral damage rarely results in a major problem with dysphagia. When other conditions that cause dysphagia are present, however, the dysphagia is often prolonged, and oral intake becomes nearly impossible. Here we report on a case of successful direct swallowing therapy by head rotation in a 77-year-old male following postoperative bilateral RLN paralysis after a thoracic aortic aneurysm repair. He complained that hoarseness had appeared before surgery, but dysphagia developed from complicating RLN paralysis and cerebral infarction after surgery. The patient was being fed via a nasogastric tube because of aspiration, but because there were bilateral differences in pharyngeal function, direct swallowing therapy using head rotation was effective. We began direct swallowing therapy using this compensation method. The patient achieved sufficient oral intake and was discharged from our hospital. Whether direct swallowing therapy can be performed usually plays an important role for discontinuation of nasogastric tube feeding in patients with severe dysphagia. In patients who are elderly or have complications, we should be aware of pharyngeal function even

Received: January 29, 2016. Accepted: May 16, 2016
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in cases with RLN paralysis. Then, direct training for dysphagia through methods such as head rotation might be useful.

Key Words: Bilateral recurrent laryngeal nerve paralysis, Dysphagia, Rehabilitation, Head rotation.

Introduction

The recurrent laryngeal nerve (RNL) controls the movement of laryngeal muscles and sensation in the lower half of the larynx. After branching off the vagal nerve in the thoracic cavity, the right RLN passes under the subclavian artery and the left RLN runs anterior to posterior under the aortic arch, and then threads upward between the trachea and esophagus. Damage to the RLN causes vocal cord paralysis and immobility of the larynx, which causes varying degrees of hoarseness and dysphagia[1]. Unilateral RLN paralysis causes laryngeal penetration and aspiration in about 50% of patients[2], but usually hoarseness is a clinically more important problem than dysphagia[3]. In patients with bilateral RLN paralysis, bilateral vocal cord immobility leads to major problems such as airway narrowing or asphyxia. Because the pharyngeal function is normal, dysphagia usually recovers in a few months in many cases; however, with other concomitant conditions that cause dysphagia, the dysphagia is often prolonged, and independent eating is nearly impossible. Here we report on a case of successful direct swallowing therapy using head rotation that enabled independent eating in a thoracic aortic aneurysm patient presenting with left RLN paralysis before surgery, and bilateral RLN paralysis after surgery.

Patient

77-year-old male

Previous Medical History

Diabetes mellitus

Current Illness

The patient began to feel discomfort in the chest, and two weeks later developed hoarseness and coughing when drinking liquids. An ENT examination revealed no obvious disease, but the patient developed respiratory distress 3 days later and was diagnosed with a thoracic aortic aneurysm by Internal Medicine. Because of the risk of rupture of the aneurysm, an emergency arch replacement with a synthetic graft was performed. There was a prolonged postoperative disturbance of consciousness, and an MRI examination revealed the presence of a small cerebral infarction. Consciousness improved one week after surgery. There was no apparent paralysis in the extremities and no sign of airway obstruction. Since examination revealed that partial paralysis of the right vocal cord and complete paralysis of the left vocal cord had occurred, nasogastric tube feeding was started because of dysphagia. The patient was transferred to our facility for rehabilitation 3 weeks after the surgery.

Condition at admission

Although there was no apparent paralysis in the extremities, there was a mild decrease in muscle strength. In the activities of daily living (ADL) evaluation, in the motor items of the Functional Independence Measure (FIM), the patient had low scores in eating 1, bathing 5, bath/shower transfer 5, and stair climbing 1, and the total for the motor subscale was 73. In the cognition subscale, the patient scored 6 for expression, and 7 in all other items for a total of 34. The patient fatigued easily with shortness of breath and had a continuous walking distance of 80 m.

The GRBAS scale is a method created in Japan and utilized in English later for evaluating the severity of hoarseness in 4 steps from 0 to 3 as follows: G(overall grade), R(rough), B(breathy), A (asthenic), and S(strained)[4]. The G subscale ranking is 0(no hoarseness), 1(mild hoarseness), 2 (moderate hoarseness), and 3(severe hoarseness). Severity in the R, B, A, and S subscales is evaluated in the same manner from 0 to 3. The scores were G(2), R(0), B(2), A(1), and S(0), with the score for "breathy hoarseness" standing out. In addition, the score in the dysphagia severity scale (DSS) was 2 (Table 1)[5], and in the Food Intake LEVEL Scale, grade 2 (Table 2)[6]. The outcome of the repetitive saliva swallowing test was 3 times/30 seconds.

Treatment plan

Muscle strength had declined, but there was no obvious paralysis, so we decided to use physical and occupational therapy methods for muscle strength training, walking training, and ADL training. For speech therapy, we decided to begin with voice training, and for indirect swallowing, we performed a video fluoroscopic swallowing study (VFSS) during the course of therapy. Swallowing training gradually shifted from indirect to direct when possible.

Course of therapy

Finally, the FIM motor subscale improved to 89 points. With regard to the hoarseness, both speech and vocalization stabilized when finger pressure was applied to the right side of the neck, and the head was rotated to the left. The patient was able to converse about 2 weeks after admission. On the GRBAS scale, the scores improved to 2 for G, 0 for R, 2 for B, 1 for A, and 0 for S. For the dysphagia, VFSS

Table 1. Dysphagia severity scale

Dysphagia severity scale		Definition
7	Within normal limits	No condition of dysphagia
6	Minimum problems	Some symptoms of dysphagia without aspiration
5	Oral problems	Significant symptoms of oral preparatory or oral phase without aspiration
4	Occasional aspiration	Possible aspiration or aspiration under chew swallow
3	Water aspiration	Aspiration of thin liquid
2	Food aspiration	Food aspiration with no effect of compensatory techniques or food consistency changes
1	Saliva aspiration	Unstable medical condition because of severe saliva aspiration

Table 2. Food Intake LEVEL Scale

No oral intake	Level 1	No swallowing training is performed except for oral care.
	Level 2	Swallowing training not using food is performed.
	Level 3	Swallowing training using a small quantity of food is performed.
Oral intake and alternative nutrition	Level 4	Easy-to-swallow food less than the quantity of a meal (enjoyment level) is ingested orally.
	Level 5	Easy-to-swallow food is orally ingested in one to two meals, but alternative nutrition is also given.
	Level 6	The patient eats three meals by excluding food that is particularly difficult to swallow.
Oral intake alone	Level 7	Easy-to-swallow food is orally ingested in three meals. No alternative nutrition is given.
	Level 8	The patient eats three meals by excluding food that is particularly difficult to swallow.
	Level 9	There is no dietary restriction, and the patient ingests three meals orally, but medical considerations are given.
	Level 10	There is no dietary restriction, and the patient ingests three meals orally (normal).

was performed using jelly and thickened liquid at 30° and 45° reclining positions one week after admission. VFSS showed pharyngeal residue bilaterally especially in the left side. Aspiration occurred at the median position and right rotated position of the neck. However at the left rotated position of the head, pharyngeal residue reduced aspiration disappeared. Therefore, direct swallowing training was started with the patient sitting in a 30° reclining position with head rotation to the left. Training with blender-prepared meals was started 2 weeks after admission. VFSS was performed again 4 weeks after admission, and no aspiration was found with the patient sitting in 45° and 60° reclining positions if the patient performed left head rotation even with the chin up. Aspiration and pharyngeal residue was found to diminish comparing to the previous examination. Nasogastric tube feeding was discontinued, and the patient was permitted to eat all 3 blender-prepared meals independently in 60° reclining position with a 60° left head rotation. Starting at week 5 after admission, the form of the meals was changed to semisolid food and thickened rice porridge for dysphagia patients, and starting at week 7, gradually changed to bite-sized pieces of soft-boiled rice and vegetables. At week 8, we performed the fiberoptic laryngeal inspection again and found that the right vocal cord was fixed at the paramedian position and there was incomplete closure of the glottis with vocalization on the left. Incomplete right vocal cord paralysis and left vocal cord paralysis can be identified (Fig. 1). The DSS classification improved to 3, and the eating and swallowing grade improved to 7, so 11 weeks after admission the patient was discharged to his home after instructions to his family.

Discussion

The causes of RLN paralysis have been reported as follows: intubation under general anesthesia (7.5%), surgical stress damage due to esophageal cancer and thyroid cancer (33%), idiopathic (22%), and direct damage from malignant neoplasms (19%)[7]. Left RLN damage caused by cardiovascular disease is called Ortner's syndrome, but this condition is rare, and particularly when an aortic aneurysm

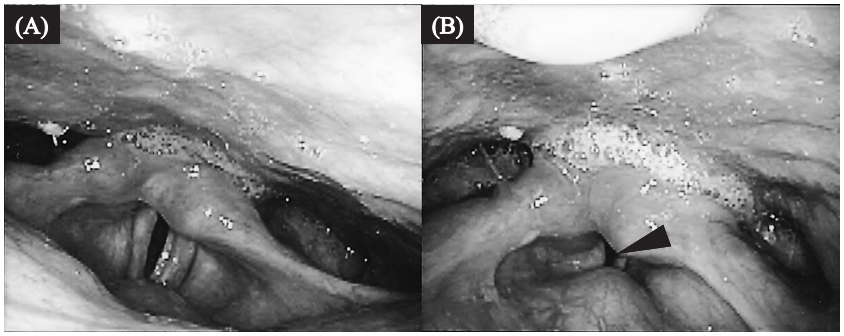

Fig. 1. Via fiberoptic inspection of the larynx. (A) The right vocal cord is fixed in the paramedian position without vocalization. (B) Incomplete glottic closure with vocalization is indicated by the arrowhead. Incomplete right vocal cord paralysis and left vocal cord paralysis can be identified.

is the cause, hoarseness and dysphagia may occur before any sensation of pain[8-10]. In terms of the prognosis of vocal cord paralysis, recovery after one year has been reported for paralysis following esophageal cancer surgery in 41% of patients[11], and improvement has been found after 6 months in 84% of patients subsequent to surgery for thoracic aortic aneurysm[12]. Surgery for thoracic aortic aneurysm is considered a cause of left RLN damage because it is often an emergency procedure for a life-threatening condition, and the nerve cannot be spared[5].

Because our patient experienced hoarseness and dysphagia before surgery and even an ENT doctor had not discovered any findings, we believe the RLN was compressed by the thoracic aortic aneurysm, which caused paralysis of the left RLN only[13]. Intubation for general anesthesia or the surgical procedure itself added incomplete paralysis of the right RLN, resulting in bilateral RLN paralysis. Furthermore, the effects of major surgery and advanced age were contributory; since swallowing function decreased and eating became impossible, a previous physician initiated nasogastric tube feeding in week 2 because no signs of improvement were present. As a result, the swallowing function might have declined even more from disuse when the patient was transferred to our facility 3 weeks after surgery.

When some swallowing function remains, compensation is possible through direct swallowing training that utilizes body and limb positions; generally a neck flexion position, reclining position and, if there is left-right difference in pharynx function, head rotation are used. Head rotation reduces pharyngeal residue by widening the pharyngoesophageal opening on the opposite side of the rotation to form a food bolus pathway and is a useful method for treating bulbar and pseudobulbar paralysis. In this bilateral RLN paralysis case, pharyngeal function basically was not impaired, so the compensation method by head rotation is considered not to be effective for dysphagia. But in some cases, such as elderly patients or patients with massive surgical invasion, even in the absence of an apparent cause, an impairment of pharyngeal function occurs. In this case in the same manner, we could determine no defined cause for dysphagia but RLN paralysis. However supraglottic swallow method should be applied for the impairment of glottal closure, it was considered to avoid increasing intrathoracic pressure for the post-operative state of aneurysm. Then a bilateral difference in pharyngeal function was seen on the

VFSS, and a trial of head rotation was applied; then, direct swallowing training could be started successfully. Therefore, the patient could be successfully removed from nasogastric tube feeding at week 4 after admission to our facility.

The decision to initiate eating in dysphagia patients who are elderly or have complicating conditions is often delayed because of the risk of aspiration pneumonia. Meanwhile, there is a substantial risk of aspiration pneumonia with nasogastric tube feeding, and it should not be continued without careful consideration. In this patient, severe dysphagia occurred from bilateral RLN paralysis after thoracic aortic surgery at an advanced age, which was compounded by disuse. With rehabilitation therapy, however, the patient was able to eat independently and could be discharged to his home on week 11 after admission.

In the cases of dysphagia in elderly patients like this case, compositive causes other than primary disease may complicate dysphagia and other complication sometimes embarrass us to apply appropriate training. We considered that we should try various kinds of compensative method in such cases for the best treatment.

Conclusion

We treated a patient who had presented with left RLN paralysis associated with a thoracic artery aneurysm, and later developed severe dysphagia from bilateral RLN paralysis as a postoperative complication. The patient successfully achieved independent eating through rehabilitation, and we believe that starting active direct swallowing training by head rotation was very useful in improving swallowing function.

The authors indicated no potential conflict of interest.

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〈和文抄録〉

胸部大動脈瘤術後の両側反回神経麻痺に頭部回旋法を用いた直接嚥下訓練が有効であった1例

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反回神経（RLN）麻痺は嗄声や嚥下障害をきたすが，片側の障害では重度の嚥下障害を生じることは少ない．しかし両側麻痺や他の嚥下障害をきたす疾患を合併すると，嚥下障害が遷延化して経口摂取が困難になることが多い．胸部大動脈瘤術後に両側RLN麻痺と脳梗塞の合併で生じた嚥下障害に対し，頭部回旋法を用いた訓練が有効であった1例を報告する．77歳，男性．胸部大動脈瘤術前から嗄声と咳嗽を自覚しており，術後に両RLN麻痺と嚥下障害をきたした．誤嚥のため経鼻経管栄養を施行されていたが，咽頭機能に左右差を認めたため，頭部回旋による直接嚥下訓練を行ったところ有効であった．嚥下機能が改善し経口摂取方法が確立したため，自宅退院が可能になった．重度嚥下障害を伴う症例における経鼻経管栄養からの離脱には，直接嚥下訓練を行えるかどうかは重要である．高齢や合併症を有する症例では反回神経麻痺であっても咽頭機能に注意する必要があり，頭部回旋法などの代償法が有効である可能性がある．

キーワード：両側反回神経麻痺，嚥下障害，リハビリテーション，頭部回旋法．