



## IS CUFF LEAK TEST VALID IN MANAGING DIFFICULT EXTUBATION AFTER CERVICAL SPINE FUSION OPERATION?

### SERVİKAL OMURGA FÜZYON AMELİYATI SONRASI ZOR ENTÜBASYON UYGULAMASINDA "CUFF LEAK" GEÇERLİ BİR TEST MİDİR?

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#### SUMMARY:

We report a 38 year old male patient underwent basilar invagination and Arnold-Chiari type I malformation. Although he has effective spontaneous ventilation, he is fully awake, there were no signs of laryngeal edema, and negative cuff leak test following the extubation the patient could not breathe because of complete laryngeal obstruction at the end of the operation. The patient could not be ventilated via a face mask, supraglottic airway, and intubation bought but could be ventilated with emergent tracheostomy under sedation. Airway complications after posterior cervical spine surgery are the most commonly because of laryngeal edema and macroglossy. If there is risk of airway edema for extubation, difficult intubation and extubation management strategy should provide lifesaving factor in cervical spine surgery.

**Key Words:** Airway tube, Cervical fusion, Chiari Malformation, Cuff-leak test, Difficult extubation, Posterior spine surgery

**Level of Evidence:** Case report, Level IV

#### ÖZET:

Baziler invajinasyon ve Arnold-Chiari tip I malformasyonu olan 38 yaşında erkek hasta sunuldu. Etkili bir spontan solunumu olması, tam uyanık olması, larinks ödemeine ait bir bulgusu olmaması ve negatif "cuff-leak" testi olmasına rağmen ameliyat sonunda tam bir laringeal tıkanma sonucunda ekstübasyon sonrası hasta nefes alamadı. Hasta yüz maskesi ve supraglottik hava yolu cihazı ile nefes alamadı ve sedasyon altında acil trakeostomi açıldı. Posterior servikal omurga ameliyatları sonrası hava yolu komplikasyonları en sık larinks ödemi ve makroglosi nedeniyle gelişir. Posterior servikal omurga cerrahisinde ekstübasyonda hava yolunda ödem gelişme riski varsa zor entübasyon ve ekstübasyon yönetimi stratejisi hayat kurtarıcı olur.

**Anahtar Kelimeler:** Chiari malformasyonu, Cuff-leak test, Havayolu tüpü, Posterior omurga cerrahisi, Servikal füzyon, Zor entübasyon

**Kanıt Düzeyi:** Olgu sunumu, Düzey IV

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## INTRODUCTION:

The airway complications associated with anterior cervical spine operations depend on pharyngeal edema, hematoma, graft dislodgement, angioedema, and leakage of cerebrospinal fluid<sup>8,9</sup>. Airway complications after posterior cervical spine surgery are most common due to laryngeal edema and macroglossia<sup>2</sup>. Although incidence of the airway complications is 6.1 %, life threatening serious airway obstruction requiring tracheostomy or reintubation is rare as 1.9%<sup>8</sup>. Here we report a patient who underwent emergent tracheostomy after negative cuff leak test and unsuccessful ventilation via a face mask, supraglottic airway, and intubation bought due to laryngeal edema and failed reintubation by direct laryngoscopy because of immobilization of the neck due to cervical (C) 1-2 fixation and fusion operation posteriorly.

## CASE REPORT:

A 38 year-old male patient with ASA 1 physical status was scheduled for basilar invagination and Chiari type I malformation. He had a short neck, low hairline, inability of tilting head, and restricted neck extension with Mallampati score of 3.

Following monitorization, orotracheal intubation was performed with a fiberoptic bronchoscope under Propofol sedation. Anesthesia was lasted for 5 h 40 min and duration of surgery was 5 h 20 min. At the final of the operation, total blood loss and urine outputs were 3400 ml and 1000 ml respectively. During the operation, 6 unites erythrocyte suspensions and 3 unites fresh frozen plasma in addition to 2900 ml colloid and 2500 ml of crystalloid solutions were infused.

The valve of at the end of the anesthesia, neither marked facial nor scleral edema was observed, SpO<sub>2</sub> was greater than 95 % during spontaneous ventilation with room air and the patient was fully awake responds to verbal stimuli such as hand-wringing and lifting his head. The air leak test was negative and extubation was decided. Intubation bought was inserted. Just after tracheal tube was removed, the patient showed the signs and symptoms of upper airway obstruction with holding up his hands to his neck and he could not breathe at all. The patient could not be ventilated via a face mask, supraglottic airway (ILMA), and intubation bought failed reintubation by direct laryngoscopy. After tracheostomy was performed by an ear-throat and nose surgeon, the heart rate was 20-30 breath/min and SpO<sub>2</sub> was 20-30 %, electrocardiography (ECG) showed ventricular fibrillation. Therefore rapidly defibrillation was used after that ECG was sinus rhythm. When tracheostomy cannula was introduced, SpO<sub>2</sub> was rapidly increased to 90%. Laryngeal edema was observed by fiberoptic laryngoscopy in the intensive care unit. The invagination into posterior fossa of upper cervical region, shallow posterior fossa, narrow foramen magnum, and metallic

fixation materials were seen on computerized tomography postoperatively. At the 4<sup>th</sup> postoperative day, the patient could breathe spontaneously through the tracheostomy cannula. However, the patient presented spastic paresis on the right lower extremity, hyperactive deep tendon reflexes, difficulty in swallowing, and articulation disorder.

## DISCUSSION:

Basilar invagination is a developmental defect of basiocciput and rim of foramen magnum with normally growled odontoid and arch of atlas which may cause odontoid and arch of atlas invagination<sup>4</sup>. Operative treatment is required to stabilize the craniovertebral junction. The atlantooccipital gap, distance from the posterior arch of the atlas to the occiput, and a narrow atlanto-occipital gap have been suggested as a cause of difficult intubation<sup>8,9</sup>. We intubated the patient using fiberoptic bronchoscopy (FOB) because of restricted extension of the neck poor view of oropharynx.

The risk factors particular with airway obstruction after cervical spine operations include exposures above C4, predicted blood loss greater than 300 ml, transfusion of four or more red cell units, and operative time of >5 hours<sup>2,8</sup>. In this case, operation time lasting 5 hours, 6 units red cell transfusion because of 3400 ml blood loss and C1-C2 fixation and fusions are risk factors for postoperative respiratory failure because of upper airway obstruction. One of the etiologic factors of pharyngeal and laryngeal edema is declined venous return from the upper neck and face during prone position<sup>8</sup>. The patient who has a difficult airway at the anesthetic induction time must be considered as having a difficult airway at the time of extubation<sup>7</sup>. And also the patient has a difficult intubation that we performed fiberoptic for intubation<sup>3</sup>. It is suggested that when there is a suspicion that a patient may have difficulty with oxygenation and ventilation after tracheal extubation the clinician could plan the reintubation management<sup>1,7</sup>. In addition to have difficult airway at the anesthetic induction time, our patient's neck was fixed at mild flexion position at the end of the operation additionally.

We did not observe scleral edema and macroglossia as the predictors of laryngeal edema just after the operation. We performed a cuff leak test for responsive and spontaneously breathing patient by turning off the cuff, blocking the endotracheal tube opening and hearing a leak around the cuff while the patient inspired<sup>2</sup>. We did not determine air leakage. Because cuff leak test's poor sensitivity in detecting subsequent ventilatory failure after extubation<sup>2,7</sup> and absence of clinical predictors of pharyngeal and laryngeal edema we decided to extubate the patient. Intubation bought was inserted to guide for reintubation. When the patient could not breathe just after extubation, ear-throat-neck surgeon was called for emergent tracheotomy. The patient could be ventilated

through the tracheostomy cannula successfully. Although reintubation management plan is necessary for difficult extubation, personal experience of the practitioner is the main determinant in electing the strategy<sup>1,6</sup>. Also postoperative fiberoptic assessment of the airway for confirmation of airway edema would reduce the incidence of airway complications after cervical spine surgery<sup>2,10</sup>.

Cuff leak test is used to evaluate confidently for subglottic caliber for difficult extubation<sup>5</sup>. And also intubation bought is put into before tracheal extubation to accelerated intubation. The patient's cuff leak test was negative and there were no clinical signs of pharyngeal or laryngeal edema. The patient was fully awake and could breathe spontaneously at the end of the anesthesia. Although the cuff leak test may not predict laryngeal edema after extubation. In conclusion, neither cuff leak test nor supraglottic airway (ILMA), intubation bought is used difficult extubation management safety. If there is a probability of airway edema, postoperative fiberoptic evaluation of the airway would prevent early extubation and the reintubation management strategies will be lifesaving factor in cervical spine surgery. And also anesthesiologist could be the tracheostomy cannula successfully as ear-throat-neck surgeon.

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