



RISK FACTORS FOR DELAYED EXTUBATION IN THE MANAGEMENT OF SEVERE OSSIFICATION OF THE POSTERIOR LONGITUDINAL LIGAMENT IN THE CERVICAL SPINE (OSSIFIED POSTERIOR LONGITUDINAL LIGAMENT) LAMINECTOMY

Anaesthesiology

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ABSTRACT

Study Design. Retrospective database analysis.

Objective. To identify the risk factors for a delayed extubation after cervical spine surgery for cervical OPLL in posterior approach.

Background Data: Though the airway and surgery related complications are documented in cervical spine surgery, proper planning may reduce the incidence. Patients usually require prolonged mechanical ventilation or/and re-intubation for airway support. Despite the potential severity of these complications, there are limited data in the published literature addressing this issue. Multiple risk factors are correlated with postop airway problems in combined spinal surgery but specifically for posterior approach data is lacking.

Methods: 50 ASA(American Society of anaesthesiology) I to III patients posted electively for posterior approach surgery were only included. Different risk factors were recorded to assess extubation difficulty.

Results: Out of 50 patients, 14 had extubation difficulty. Duration of surgery and numbers of levels are main risk factors with odds ratio of 1.022 and 2.365 respectively. ASA classification, NYHA classification and preoperative neurological dysfunction are also among the major risk factors contributing for delayed extubation.

Conclusion: Duration of surgery and levels of spine involved are primary risk factors involved for difficult extubation.

KEYWORDS:

Cervical spine, extubation, risk factors.

Introduction:

Airway related events are common after cervical spine surgery leading to long ventilator stay. Previous studies documented that the patients with prolonged procedures (i.e., >5 hours) exposing more than three vertebral levels that include C2, C3, or C4 with more than 300-mL blood loss and even combined anterior and posterior approach are the risk factors for postoperative ventilator insufficiency. (1, 2) While a posterior approach avoids many of these potential complications. Airway obstruction is a well-recognized complication after neck surgery, including cervical spine surgery. (3, 4, 5) But the risk factors are same or different in posterior approach? The various factors related to postoperative airway complications are not studied. Hence we carried this retrospective study to find the risk factors for extubation failure in cervical ossified posterior longitudinal ligament (OPLL) surgery through posterior approach.

Aim and Objectives:

- To find the risk factors related to prolonged intubation in cervical ossified posterior longitudinal ligament (OPLL) surgery through posterior approach.
- To correlate various factors for extubation failure and needing elective ventilation

Material and Methods:

After ethics committee approval, we retrospectively collected data from medical records during 2015 and 2016. Informed consent had been taken from all patients before surgery. We analysed data of 50 patients, electively posted for cervical OPLL surgery through posterior approach. ASA(American Society of anaesthesiology) I to III patients posted electively for posterior approach surgery were only included.

Those patients with coronary heart disease, prior very poor lung function, already intubated outside for airway compromise or poor efforts due to cervical myelopathy, or patients in need of both anterior and posterior approach were excluded from the study.

Data collected from patients were recorded as follows: patient factors which are sex, age, BMI, ASA classification, NYHA class (New York Heart association) for respiratory assessment, smoking history, restricted neck movements, neurological deficit before operation, previous history of cervical spine surgery, surgical factors which are number of cervical spine surgeries, upper cervical spine involvement, operative time and anaesthetic factors which are intubation technique,

volume of blood loss during operation. As a outcome measure, we considered extubated means on table extubation. Those who are reintubated and/or not extubated, tracheostomised are included in non-extubated category. The intensive care stay was also noted.

Univariate analysis was performed in each variable factor between successful group and delayed extubation by Chi-square or Fisher's exact test which is reported in p-value. A p-value <0.005 was considered statistically significant. Then multivariate analysis was performed by multiple logistic regression to find out the real factors which are reported in odds ratio and 95% confidence interval.

Results:

Out of 50 patients posted for posterior approach cervical spine surgery, 26 patients were extubated immediately means on table extubation. The demographic distribution of data and various preoperative variables leading to delayed extubation are given in (Table 1). From the table, ASA class, NYHA class, upper cervical involvement and preoperative neurological deficit are direct risk factors for poor airway outcome in postoperative period. These are patient related risk factors. Among surgical factors, duration of surgery and levels of cervical spine are major contributing risk factors for delayed extubation with p value of 0.003 and 0.001 respectively. (Table 2). Multiple regression analysis has shown duration of surgery and numbers of levels are main risk factors with odds ratio of 1.022 and 2.365 respectively. ASA classification, NYHA classification and preoperative neurological dysfunction are also among the major risk factors contributing for delayed extubation. (Table 3). Out of 14 patients, 5 patients needed ICU stay for more than 4 days. Rest shifted to ward in one or two days after extubation. Out of 5 patients, one patient needed tracheostomy to wean.

Table 1: Patient demographic data compares between the immediate extubation and delayed extubation groups.

(The data was displayed in number, percentage / ± SD and p-value)

	Immediate extubation (n=26)	Delayed extubation (n=14)	pValue
Gender (M:F)	20:6	8:6	.281
AGE (years)	53.88 ± 7.12	50.01 ± 12.63	.239
BMI (kg/m ²)	23.29 ± 3.31	23.18 ± 3.92	.923

ASA	1.35 ± 0.45	1.86 ± .86	.021
NYHA	1.38± 0.58	2± 0.67	.004
COPD & Asthma	1 (2.5%)	3 (7.5%)	.115
Diabetes	7 (17.5%)	6 (15%)	.480
Hypertension	6 (15%)	3 (7.5%)	.905
Pre-operative neurological deficit	7 (17.5%)	12 (30%)	.001
Anticipated difficult airway	10 (25.5%)	9 (22.5%)	.186
Smoking	5 (12.5%)	6 (15%)	.147
Upper cervical involvement	15 (37.5%)	13 (32.5%)	.03
Reduced neck movements	10 (25%)	9 (22.5%)	.186

Table 2: Surgical factors compare between immediate extubation and delayed extubation group. (The data was displayed in number, percentage and p-value)

	Immediate extubation (n=26)	Delayed extubation (14)	pValue
Adjuvants for intubation	10 (25%)	9 (22.5%)	.186
Duration of surgery (hrs)	179.23 ±37.72	227.64 ±46.63	.003
Blood loss (ml)	97.31±34.82	124.29±32.52	.533
No of surgical levels	3.03 ±0.93	5.71 ± 1.51	.001
Intra operative inotrope required	5 (12.5%)	1 (2.5%)	.399

Table 3: Factors influencing delayed extubation after cervical spine surgery after multiple logistic regression.

	P value	Odds ratio
Pre operative neurological dysfunction	.416	.323
ASA	.310	3.324
NYHA	.986	.984
DOS	.130	1.022
no of surgical level	.043	2.365

Discussion:

Ossification of the posterior longitudinal ligament (OPLL) is a disorder of progressive ectopic calcification and ossification of the cervical and thoracic segments of the posterior longitudinal ligament (PLL) that results in a compressive myelopathy and/or radiculopathy. The decompression can be done through anterior or posterior approach. Anterior decompression yielded better outcomes than a posterior approach for severe OPLL (6, 7, and 8) but anterior approach – related complications related to injury to the soft-tissue structures of the neck are well known. These include temporary or permanent dysphagia, recurrent laryngeal or superior laryngeal nerve injury, vertebral artery injury, esophageal perforation, and soft-tissue swelling that constricts the airway and necessitates prolonged intubation or tracheostomy. (1) In posterior approach, prone position is additive risk factor to increase airway edema.(9) Multi-level spinal surgeries often require long anesthetic and operative times in the prone position. In patients who have just undergone extensive cervical spine procedures, emergency reintubation or tracheostomy can lead to a significant incidence of graft-related or neurological complications, hypoxia, and death. Potential causes of airway obstruction include pharyngeal edema (10), hematoma, (11) cerebrospinal fluid leak, (12) angioedema (13), and graft or plate dislodgment. (11)

The published literature reports a higher rate of postoperative respiratory compromise (1.6%–6%). (1, 14, 15). Patients with prolonged procedures (i.e., >5 hours) exposing more than three vertebral levels that include C2, C3, or C4 with more than 300-mL blood loss should be watched carefully for respiratory insufficiency. In one study, Bone morphogenic protein was responsible for airway obstruction. (16) One recent study (17) demonstrated the rate of postoperative prolonged ventilation and reintubation after combined spine surgery is 0.62% and 0.64%. Independent predictors for a postoperative reintubation include a history of recent weight loss more than 10%, recent operation within 30 days, low preoperative hematocrit, and a high serum creatinine level respectively. This was done for both anterior and posterior approach i.e. combined spinal surgery and included multiple variables. In another study conducted by Rowbottom J et al(18), long operative times, large volumes of crystalloid administration, and blood loss were significant factors in patients with delayed extubation In our study, we retrospectively analysed 50 patients only posted for posterior approach cervical spine surgery and found 14 patients had delayed extubation (28%) and 26 patients (52%) were safely extubated on table. Though it is not

statistically significant, delayed extubation is the reason for prolonged ventilation and increased morbidity. In this study, ASA class, NYHA class, upper cervical involvement and preoperative neurological deficit are direct patient related risk factors for poor airway outcome in postoperative period. This suggests that, proper preoperative assessment is very important to plan anaesthesia and to have good outcome. Upper cervical involvement adds to risk as may be surgical issues or the above factors contribute. (3, 19) The study also demonstrated that duration of surgery and numbers of levels are main risk factors along with ASA classification, NYHA classification and preoperative neurological dysfunction. Reduced neck movements and anticipated difficult airway have not contributed much for delayed extubation with non-significant p value. That suggests, if planned intubation is done in anticipated difficult airway, contributes least for extubation difficulty.

Conclusion:

Duration of surgery and numbers of cervical levels along with ASA classification, NYHA classification and preoperative neurological dysfunction are the major risk factors contributing for delayed extubation. Hence proper planning is important if more numbers of cervical vertebrae are involved and duration is more for the surgery. This is to avoid reintubation and airway trauma.

Conflict of interest- Nil

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