

ОРИГИНАЛЬНЫЕ СТАТЬИ

УДК 616.8-089: 616.231: 616-083.94

Iype Cherian, Hira Burhan

Nobel Institute of Neurosciences, Nobel Medical College and Teaching Hospital, Nepal

LATERAL POSITIONING TO PREVENT POST-EXTUBATION COMPLICATIONS IN NEUROSURGICAL PATIENTS WITH A MOTOR SCORE OF 5

Objective: Complications following extubation in neuro-intensive care units are high, particularly in patients with a motor score of 5. Maneuvers such as lateral position allow for a reduction in such complications by increasing airway and eliminating the need for re-intubation in such patients.

Methods: A prospective observational study was carried out between July and October 2018 in 110 patients admitted to the neuro-intensive unit with a motor score of 5. The incidence of post-extubation aspiration (PEA) characterized by fever with patches on chest x-rays and the need for re-intubation was noted and the difference was observed among the patients being positioned supine (n=50) vs those positioned laterally (n=60).

Results: There was a significant decrease in the incidence of post-extubation aspiration in supine (44%, n=22/50) vs lateral position (20%, n=12/60), $p=0.007$. The incidence of fever with colonization seen in lower airways on x-ray in patients with supine position was 54% (n=27/50) vs 24% (n=15/60), $p=0.002$. A strong correlation was found between the duration of ICU stay and the development of PEA ($R=0.757$; $P=0.000$).

Conclusion: Patients in neuro-intensive care with a motor score of 5 need to be strictly monitored for development of complications following extubation and maneuvers such as lateral positioning can be of benefit in preventing such complications. This study concludes that positioning of patients in a lateral direction has benefits of reducing the incidences of PEA and lower airway colonization in contrast to supine position.

Keywords: neuro-intensive Care; Extubation; Lateral positioning.

Introduction.

Extubation is a critical step in optimum management of post-surgical and critically ill patients. Post extubation complications are not uncommon, particularly in neuro-intensive units with patients presenting with neuronal damage and impaired consciousness.

Laryngeal edema is perhaps the most commonly occurring complication following extubation and may often result in complete airway obstruction with an urgent need to re-intubation [1]. Other complications like PEP secondary to bacterial colonization in lower airways, have also been described in various intensive care settings. Perhaps the most important predictor of these complications is the motor score at the time of extubation. In patients with a motor score of 6, there is a good control of motor tone thereby decreasing chances of complications. In patients with much lower motor scores (4 and less) it is advised to continue intubation until further improvement ensues. What is of concern is to monitor the development of complications in patients with a motor score

of 5, where the post-extubation period should be carefully managed.

Studies report the incidence of supra and infra-glottic post-extubation aspiration (PEA) as one of the most commonly occurring complication in intensive care units. Longer duration of intubation and ICU stay, together with a depressed motor response contribute significantly to aspiration and later, pneumonia in these patients, only worsening the patient prognosis and outcomes. Positioning patients in lateral position after extubation has shown to reduce development of early complications. This maneuver prevents the tongue rolling and stimulates swallowing reflex through pyriform sinus, hence reducing chances of aspiration and subsequent pneumonia.

Methodology.

A prospective observational cohort was conducted for 3 months in a 35-bedded neuro-intensive care unit at the Nobel Institute of Neurosciences in Nepal. Inclusion criteria included all extubated patients in ICU with a motor score of 5 on GCS evaluation. Patients still intubated or with a motor score of 6 or 4

(and less) were excluded. A total of 110 patients fulfilling the inclusion criteria were enrolled in the study. Out of these, 50 patients were kept in supine position post extubation (control group) and 60 were placed in a lateral position (study group). Both groups were observed and compared for any differences in incidence of PEA as characterized by fever and colonization in lower airways, as well as any need for re-intubation. Any correlations with the length of ICU stay and incidence of PEA were also studied for further information.

Data was analyzed using SPSS software. A chi-square test was performed to assess any significant differences between the two groups, and to evaluate the association of duration of ICU stay with the occurrence of PEA

Results:

Out of 110 patients, 73 were males, with a mean age of 39.70 and 37 were females, mean age 40.78. The control group comprised 50 patients fulfilling the inclusion criteria positioned in a supine position post-extubation. The study group comprised 60 patients placed laterally post-extubation.

The frequency of fever with colonization in lower airways as seen by chest x-ray was 27 in control group vs 15 in the study group. The difference was statistically significant ($p=0.002$). Of the 27 patients with fever and colonization of lower airways in the control group, 22 developed post-extubation pneumonia, similarly, 12 out of the 15 patients with fever and colonization of lower airways in the study group developed PEA [FIGURE 1].

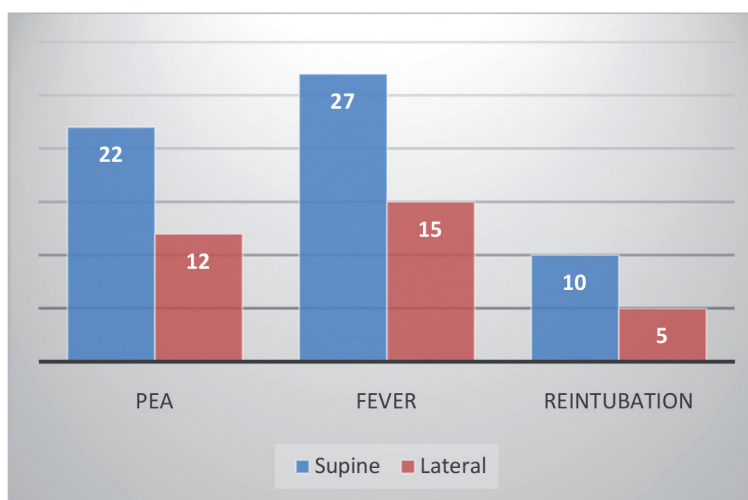


Figure 1 – Incidence of PEA, Fever and re-intubation as compared in supine (control group) and lateral (study group) positions

A strong linear correlation was found between the incidence of fever with lower airway colonization and the development of post-extubation pneumonia ($R=0.770$), and the difference in PEA development in the two groups was statistically significant ($p=0.007$). The impact of the duration of ICU days was also associated significantly with development of PEA in both

groups ($R=0.757$). Patients admitted for less than 24 hours had almost no incidence of PEA, whereas the frequency increased in patients admitted for 24-48 hours (44.12%) and more than 48 hours (52.94%); the results were statistically significant ($p=0.000$) [FIGURE 2].

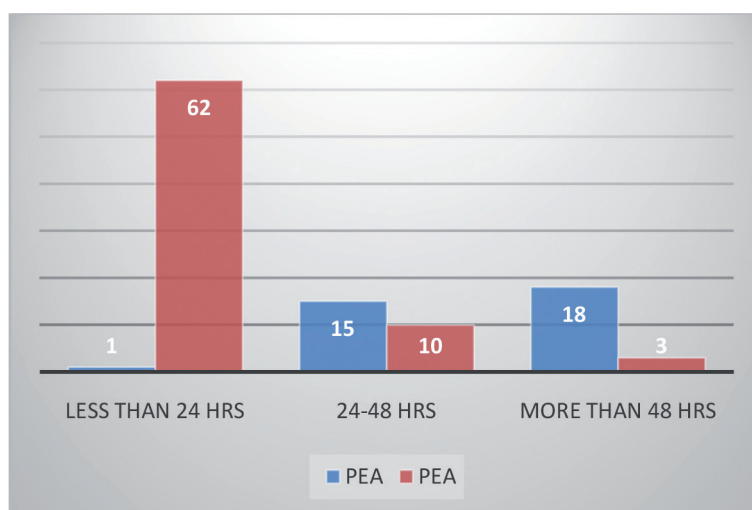


Figure 2 – Duration of ICU stay and development of Post-Extubation Aspiration (PEA)

Discussion

Complications arising during and after extubation periods in intensive care units are not uncommon. Endotracheal intubation can cause damage and ulceration of the mucosa lining the oropharynx, larynx and trachea, in almost all patients intubated for 4 days or more [2]. As a result, extensive laryngeal edema causes airway obstruction after extubation, characterized by dysphagia and stridor, and more often aspiration of swallowed contents into the respiratory tracts. Various risk factors play an important role in the development of laryngeal edema and post-extubation stridor. A predisposition to female gender has been hypothesized due to the female mucous membrane being less resistant to trauma and thinner than that in men [3]. However, some there is not much evidence to establish this correlation. Another important risk factor is the duration of intubation which has been identified by Kastanos and colleagues and by Esteller and colleagues [4, 5, 6] as a potent risk factor for laryngeal edema development.

Post-extubation pneumonia (PEP) has been regarded as one of the most dreaded and common complications arising in patients admitted to critical care units. A wide variation has been recorded by meta-analysis of various studies, with the incidence of PEP between 3% and 62% [7]. This difference can be attributed to the lack of availability of data in various centers. Nevertheless, the development of PEP always remains a challenge and a threat to patient prognosis in intensive care units.

Twenty-four hours of tracheal intubation and mechanical ventilation in semi-recumbent position can lead to significant pathogenic colonization of the

lower airways, even without any clinical signs which can promote the development of PEP [8]. Oropharyngeal contamination of the lower airways is the most important route of colonization, by potential pathogenic microorganisms, including a high load of anaerobic bacteria entering lower airways at different time intervals from the insertion of an endotracheal tube [9, 10].

Traumatic brain injury often results in peripheral and bulbar nerve damage, altering cognition, or causing the dysregulation of the swallowing reflex [11]. It is a significant predictor of silent aspiration after prolonged intubation [12] and inevitably increases the prevalence of post-extubation complications in neuro-intensive care units. Strategies directed to prevent pathogenic microbiological colonization before and after mechanical ventilation should be considered in order to avert the onset of PEP [13].

Identifying and addressing potential risk factors leading to development of PEP may of help in preventing incidences. Early extubation will decrease chances of colonization by pathogens originating from tubes. Tube size has also been considered as potential risk factor, and intubation with a 7 or 7.5 mm tube in males and a 6.5 mm tube in females has shown efficacy in preventing mucosal damage, however, there have been reports on delayed weaning after usage of smaller tubes [14]. Likewise, a small bore of nasogastric tube may also decrease the risk of PED [15].

Meta-analyses have also shown that pre-emptive administration of a multiple-dose regimen of gluco-corticosteroids can reduce the incidence of laryngeal edema and subsequent reintubation while some studies suggest that Corticosteroids should be given

only to patients at high risk of reintubation [16, 17]. In fact, corticosteroid administration before extubation is part of the extubation protocol in some centers [18].

With continued incidences of post-extubational complications, particularly after traumatic brain injury, current treatments are now focusing on dietary modifications and postural changes/compensatory maneuvers rather than interventions [19]. It is observed that positioning patients laterally during surgical procedure under general anesthesia prevents respiratory occlusion, and this observation has led to an emerging protocol for patient positioning at the time of extubation [20, 21]. Head rotation induces the bolus to pass through the pyriform sinus on the opposite side to reach the esophagus. As a result, the bolus passes via the healthy side, bypassing the damaged side of the pharynx and pyriform sinus, and more efficient swallowing is enabled. Patients whose pharynx are more paralyzed on either side can turn their head toward the paralyzed side

to narrow the piriform fossa on the paralyzed side or use the force of gravity from a side-lying or recumbent position to guide a food bolus to the non-paralyzed side [22].

This technique has been reported to be particularly effective in dysphagic patients, in particular, a motor score of 5 on Glasgow Coma Scale, accompanied with unilateral paralysis of the pharynx, larynx, and vocal cords, and those with nerve paralysis in similar regions [23].

Conclusions:

The observations made in this study show a significantly decreased incidence of PEP as characterized by fever and consolidation of lower airways, particularly in patients admitted for more than 24 hours in a neuro-intensive care unit. Patients extubated at a motor score of 5 should be positioned laterally (with head turned towards the weaker side) to avoid aspiration and resultant pneumonia.

REFERENCES

1. Wittekamp B.H., van Mook W.N., Tjan D.H., Zwaveling J.H., Bergmans D.C. Clinical review: post-extubation laryngeal edema and extubation failure in critically ill adult patients // *Crit Care*. – 2009. – 13(6). – P. 233. PMID: 20017891.
2. Kastanos N., Estopa Miro R., Marin Perez A., Xaubet Mir A., Agusti Vidal A. Laryngotracheal injury due to endotracheal intubation: incidence, evolution, and predisposing factors. A prospective long-term study // *Crit Care Med*. – 1983. – 11. – P. 362–367. doi: 10.1097/00003246-198305000-00009.
3. Darmon J.Y., Rauss A., Dreyfuss D., Bleichner G., Elkharrat D., Schlemmer B., Tenaillon A., Brun Buisson C., Huet Y. Evaluation of risk factors for laryngeal edema after tracheal extubation in adults and its prevention by dexamethasone. A placebo-controlled, double-blind, multicenter study // *Anesthesiology*. – 1992. – 77. – P. 245–251. doi: 10.1097/0000542-199208000-00004.
4. Kastanos N., Estopa Miro R., Marin Perez A., Xaubet Mir A., Agusti Vidal A. Laryngotracheal injury due to endotracheal intubation: incidence, evolution, and predisposing factors. A prospective long-term study // *Crit Care Med*. – 1983. – 11. – P. 362–367. doi: 10.1097/00003246-198305000-00009.
5. Esteller More E., Ibanez J., Matino E., Adema J.M., Nolla M., Quer I.M. Prognostic factors in laryngotracheal injury following intubation and/or tracheotomy in ICU patients // *Eur Arch Otorhinolaryngol*. – 2005. – P. 262:880–883. doi: 10.1007/s00405-005-0929-y.
6. Skoretz S.A., Flowers H.L., Martino R. The incidence of dysphagia following endotracheal intubation: a systematic review // *Chest*. – 2010. – 137(3). – P. 665–673.
7. Behrendt C.E. Acute respiratory failure in the United States: incidence and 31-day survival // *Chest*. – 2000. – 118(4). – P. 1100–1105.
8. Zanella A. et al. Development of post extubation pneumonia: role of 24 hours of endotracheal intubation and mechanical ventilation. An experimental study. Poster presented at: 25th ESICM ANNUAL CONGRESS in Conference: October 2012, Lisbon, Portugal.
9. Kondratas T. et al. Microbial colonization of the lower airways after insertion of a cuffed endotracheal tube in pediatric patient // *Edit Signa Vitae*. – 2018. – 14(1). – P. 30–37. DOI: 10.22514/SV141.052018.5.
10. Agvald-Ohman C., Wernerman J., Nord C.E., Edlund C. Anaerobic bacteria commonly colonize the lower airways of intubated ICU patients // *Clin Microbiol Infect*. – 2003. – 9(5). – P. 397–405. PMID:12848752.
11. Goldsmith T. Evaluation and treatment of swallowing disorders following endotracheal intuba-

- tion and tracheostomy // *Int Anesthesiol Clin.* – 2000. – 38(3). – P. 219–242.
12. Varela J.E. et al. Incidence and predictors of aspiration after prolonged intubation in trauma patients // *Journal of the American College of Surgeons.* – 2004. – 99(3). – P. 76. <https://doi.org/10.1016/j.jamcollsurg.2004.05.164>.
 13. Rezoagli E., Zanella A., Cressoni M., De Marchi L., Kolobow T., Berra L. Pathogenic Link Between Postextubation Pneumonia and Ventilator-Associated Pneumonia: An Experimental Study // *Anesth Analg.* – 2017. – 124(4). – P. 1339-1346. PMID: 28221200.
 14. Wittekamp B.H., van Mook W.N., Tjan D.H., Zwaveling J.H., Bergmans D.C. Clinical review: post-extubation laryngeal edema and extubation failure in critically ill adult patients // *Crit Care.* – 2009. – 13(6). – P. 233.
 15. Rassameehiran S., Klomjit S., Mankongpaisarnrung C., Rakvit A. Postextubation Dysphagia // *Proc (Bayl Univ Med Cent).* – 2015. – 28(1). – P. 18-20.
 16. Wittekamp B.H., van Mook W.N., Tjan D.H., Zwaveling J.H., Bergmans D.C. Clinical review: post-extubation laryngeal edema and extubation failure in critically ill adult patients // *Crit Care.* – 2009. – 13(6). – P. 233. PMID: 20017891.
 17. Duncan Y., Peter W. Preventing postextubation airway complications in adults // *BMJ.* – 2008337. – P. a1565. doi: <https://doi.org/10.1136/bmj.a1565>.
 18. Gaussorgues P., Boyer F., Piperno D., Gerard M., Leger P., Robert D. Do corticosteroids prevent postextubation laryngeal edema? Prospective study of 276 adults // *Crit Care Med.* – 1988. – 16. – P. 649. doi: 10.1097/00003246-198806000-00021.
 19. Rassameehiran S., Klomjit S., Mankongpaisarnrung C., Rakvit A. Postextubation Dysphagia // *Proc (Bayl Univ Med Cent).* – 2015. – 28(1). – P. 18-20.
 20. Cho Y. Lateral position prevents respiratory occlusion during surgical procedure under general anesthesia in the patient of huge anterior mediastinal lymphoblastic lymphoma // *Jpn J Thorac Cardiovasc Surg.* – 2004. – 52(10). – P. 476-9. PMID: 15552973.
 21. Rassam S., SandbyThomas M., Vaughan R.S., Hall J. Airway management before, during and after extubation: a survey of practice in the United Kingdom and Ireland // *Anaesthesia.* – 2005. – 60. – P. 995-1001. doi:10.1111/j.1365-2044.2005.04235.x.
 22. Kagaya H., Inamoto Y., Okada S., et al. Body Positions and Functional Training to Reduce Aspiration in Patients with Dysphagia // *JMAJ.* – 2011. – 54(1). – P. 35–38.
 23. Logemann J.A., Rademaker A.W., Pauloski B.R., Kahrilas P.J. Effects of postural change on aspiration in head and neck surgical patients // *Otolaryngol Head Neck Surg.* – 1994. – 110. – P. 222-7.

Iype Cherian, Hira Burhan

Нобель нейроғылым институты, Нобель медициналық колледжі мен оқу ауруханасы, Непал

ҚОЗҒАЛЫС ЖАУАБЫ 5 БАЛЛҒА ТЕҢ НЕЙРОХИРУРГИЯЛЫҚ НАУҚАСТАРДАҒЫ ЭКСТУБАЦИЯДАН КЕЙІНГІ АСҚЫНУЛАРДЫҢ АЛДЫН АЛУ ҮШІН БІР БҮЙІРГЕ ЖАТҚЫЗУ

Мақсаты.

Нейроқарқынды терапия бөлімшелерінде экстубациядан кейінгі асқыну жағдайлары, әсіресе, қозғалыс жауабы 5 баллға тең науқастарда өте жиі кездеседі. Бір бүйірге жатқызу сияқты әрекет тыныс алу жолдарын кеңейту және осы пациенттерге қайта интубациялау қажеттілігін жою арқылы осындай асқынуларды төмендетуі мүмкін.

Әдістері.

2018 жылдың шілде айынан қазан айына дейін нейроинтенсивті бөлімге қабылданған қозғалыс жауабы 5 баллға тең 110 науқас бойынша пер-

спективалық байқаушы зерттеу жүргізілді. Кеуде радиографиясының дақтары бар ауытқулармен сипатталатын экстубациядан кейінгі аспирацияның жиілігі және қайта интубация қажеттілігі байқалды; шалқасынан жатқан науқастар арасында (n=50) және бүйірінде жатқан науқастардың арасында (n=60) айырмашылық байқалды.

Нәтижелері.

Бүйірге жатқызумен (20%, n=12/60), p=0.007 салыстырғанда, шалқасынан жату кезіндегі экстубациядан кейін (44%, n=22/50) аспирация жиілігінің айтарлықтай төмендеуі байқалды. Шалқасынан

жатқан науқастардың рентгенограммасында төменгі тыныс алу жолдарында байқалған безгектің жиілігі 54% (n=27/50), бүйірінде жатқандарда 24% (n=15/60), p=0.002 болды. Қарқынды терапия бөлімшелерінде (ҚТБ) болу ұзақтығы мен өкпелік тромбэндартерэктомияның (P=0,757, P=0,000) дамуы арасында мықты корреляция байқалды.

Қорытынды.

Нейроқарқынды терапия бөлімшесіндегі қозғалыс жауабы 5 баллға тең науқастар экстубациядан

кейінгі асқынулардың дамуына қатаң бақылануы керек, бұл ретте бүйіріне жатқызу сияқты маневрлер мұндай асқынуларды болдырмауға көмектесуі мүмкін. Бұл зерттеуде пациенттерді бүйіріне жатқызудың өкпе тромбэндартерэктомиясын азайту және тыныс алу жолдарының колонизациясын төмендету сияқты артықшылықтарға ие екендігі жөнінде қорытынды жасалды.

Негізгі сөздер: нейроқарқынды терапия, экстубация, бір бүйірге жатқызу.

Iype Cherian, Hira Burhan

Нобелевский институт нейронаук, Нобелевский медицинский колледж и учебная больница, Непал

ПОЛОЖЕНИЕ ЛЕЖА НА БОКУ КАК ПРОФИЛАКТИКА ПОСТ-ЭКСТУБАЦИОННЫХ ОСЛОЖНЕНИЙ У НЕЙРОХИРУРГИЧЕСКИХ БОЛЬНЫХ С ДВИГАТЕЛЬНЫМ ОТВЕТОМ 5 БАЛЛОВ

Цель.

Случаи осложнения после экстубации в отделении нейроинтенсивной терапии встречаются очень часто, особенно у пациентов с двигательным ответом 5 баллов. Такие манипуляции, как расположение пациента на боку, позволяют уменьшить подобные осложнения путем расширения дыхательных путей и устранения необходимости повторной интубации у пациентов.

Методы.

Проспективное обсервационное исследование было проведено в период с июля по октябрь 2018 года у 110 пациентов, поступивших в нейроинтенсивное отделение с двигательным ответом 5 баллов. Частота постэкстубационной аспирации (РЕА), характеризующейся лихорадкой с пятнами на рентгенограмме груди и необходимость повторной интубации была отмечена, и наблюдалась разница между пациентами, находящимися в положении лежа на спине (n=50), и пациентами находящимися в положении на боку (n=60).

Результаты.

Наблюдалось значительное снижение частоты аспирации после экстубации в положении лежа

на спине (44%, n=22/50) по сравнению с боковым положением (20%, n=12/60), p=0,007. Частота лихорадки с колонизацией, наблюдаемой в нижних дыхательных путях на рентгенограмме у пациентов с положением на спине, составила 54% (n=27/50) против 24% (n=15/60), p=0,002. Была обнаружена сильная корреляция между продолжительностью пребывания в отделении интенсивной терапии (ОИТ) и развитием лёгочной тромбэндартерэктомии (R=0,757; P=0,000).

Заключение.

Пациенты нейроинтенсивной терапии с двигательным ответом 5 баллов должны строго контролироваться для развития осложнений после экстубации, и маневры, такие как боковое позиционирование, могут быть полезны для предотвращения таких осложнений. В этом исследовании делается вывод о том, что расположение пациентов на боку имеет преимущества, заключающиеся в уменьшении числа случаев лёгочной тромбэндартерэктомии и снижении колонизации дыхательных путей в отличие от положения лежа на спине.

Ключевые слова: нейроинтенсивная терапия, экстубация, боковое позиционирование.