

Manual in-line stabilisation during tracheal intubation: effective treatment or harmful dogma?

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Anaesthesia

Peri-operative medicine, critical care and pain



Anaesthesia

Association of Anaesthetists

The issue includes 12 free to access articles

Special supplement on the brain, January 2022



Arrow K. et al.
Implications of nocebo in anaesthesia care

The opportunity for anaesthetists to embrace the evidence around nocebo will allow for phrases such as 'bee sting' and 'sharp scratch' to be thought of as clumsy verbal relics of the past.



Stubbs D.J. et al.
Chronic subdural haematoma: the role of peri-operative medicine in a common form of reversible brain injury

Cases of chronic brain haemorrhage (subdural haematoma) have increased up to six-fold and those requiring surgical treatment are predicted to rise by 50%



Evered L. et al.
Acute peri-operative neurocognitive disorders: a narrative review

Delirium after surgery is associated with increased morbidity and mortality, decreased independence and an increased risk of dementia and has been estimated to cost approximately £32,234 (\$43,924; €37,996) per patient, per year.



Kayambankadzanja R.K. et al.
Pragmatic sedation strategies to prevent secondary brain injury in low-resource settings

The World Health Organization estimates that 90% of global deaths caused by injuries occur in low- and middle-income countries, with traumatic brain injury contributing up to half of these trauma-related deaths.



White L. et al.
Delirium and COVID-19: a narrative review of emerging evidence

The incidence of delirium in hospitalised patients with COVID-19 is approximately 24% but in patients in ICU the incidence is > 50%.



Dinsmore J. E. et al.
Anaesthesia for mechanical thrombectomy: a narrative review

Over 113,000 patients in the UK suffer a stroke each year, and there are 1.2 million stroke survivors with a socio-economic burden of £25.6 billion. The number of strokes is projected to increase by 60% between 2015 and 2035, with societal costs almost triple those of current costs.



Dinsmore M. et al.
Clinical applications of point-of-care ultrasound in brain injury: a narrative review

Point-of-care ultrasound of the brain is an effective, non-invasive, safe and readily available technique for the rapid assessment of cerebral anatomy and cerebral haemodynamics in patients with acute brain injuries.



Migdady I. et al.
Management of status epilepticus: a narrative review

Prolonged seizures are associated with irreversible neuronal injury resulting in increased morbidity and mortality. Early seizure control, particularly in the first 1-2 h of convulsive status epilepticus improves outcomes.



Swarbrick C. J. et al.
Evidence-based strategies to reduce the incidence of postoperative delirium: a narrative review

Delirium is defined as a state of acute confusion that is commonly reversible and preventable in approximately 40% of cases.



Wiles M. D.
Management of traumatic brain injury: a narrative review of current evidence

Globally, approximately 70 million people sustain traumatic brain injury each year and this can have significant physical, psychosocial and economic consequences for patients, their families and society.



Chung C. K. E. et al.
Peri-operative neurological monitoring with electroencephalography and cerebral oximetry: a narrative review

Monitoring cerebral oxygenation and EEG may best serve as key components of a management bundle to identify vulnerable patients and to optimise intra-operative variables.



Yim R. L. H. et al.
Peri-operative management of patients with Parkinson's disease

Parkinson's disease is a neurodegenerative disorder with multisystem manifestations affecting > 6.1 million people worldwide and its prevalence has more than doubled between 1990 and 2016.

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Propagation of historical errors

Pandora's Jar...

- 16th-century Humanist Erasmus of Rotterdam translated Hesoid's tale of Pandora into Latin
- Mistook "*pythos*" (jar) with "*pyxis*" meaning box



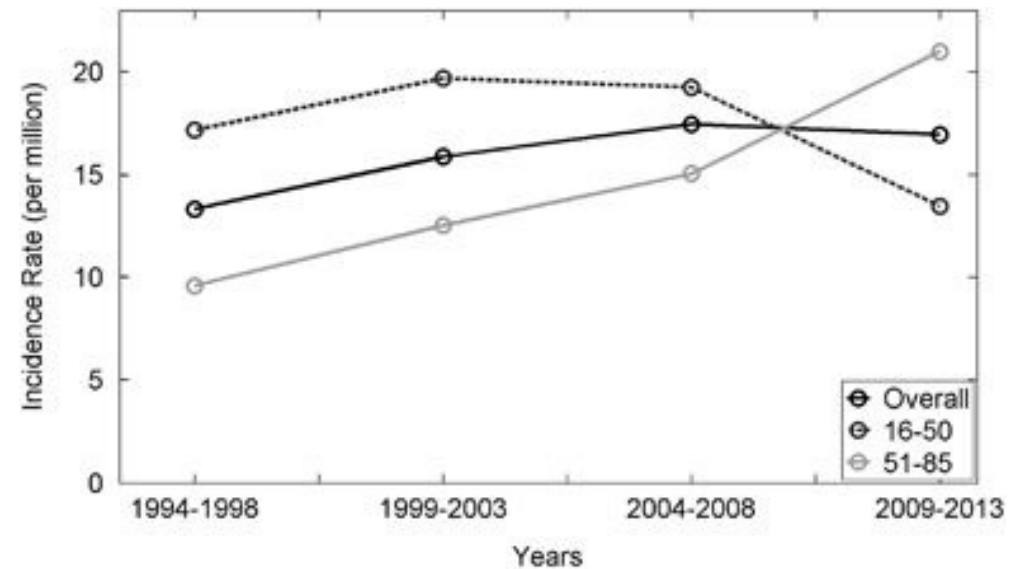
Epidemiology of SCI

Hasler et al. European Spine Journal 2011; 20: 2174-2180

McCaughey et al. Spinal Cord 2016; 54: 270-6



- Incidence 15-20/million
 - Fracture without cord injury 2%
 - Unstable 0.8%
 - Cord injury 0.8%
- Risk factors for cord injury:
 - GCS 3-8 (OR 1.93)
 - GCS 9-12 (OR 1.57)
 - Head injury (OR 0.85)





Risk of Tracheal Intubation in SCI

Sundstrøm et al. *Journal of Neurotrauma* 2014; 31: 531-40

Crosby. *Anesthesiology* 2006; 104: 1293-1318

- Most spinal injuries are stable
- Those that are unstable have already caused irreversible damage to the spinal cord



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Risk of Tracheal Intubation in SCI

Hindman et al. *Anesthesiology* 2011; 114: 782-795



- Closed Claims Analysis:
- 1970-2007 (n=7740)
 - 37 cases of cervical cord injury (0.9% of GA claims)
 - Majority (>75%) had stable c-spines prior to procedure
 - 24/37 underwent cervical spine surgery
 - Nine had unstable cervical spines
 - Two cases of cord injury with direct laryngoscopy implicated
 - Two cases occurred despite AFOI
 - Two cases despite MILS

Risk of Tracheal Intubation in SCI

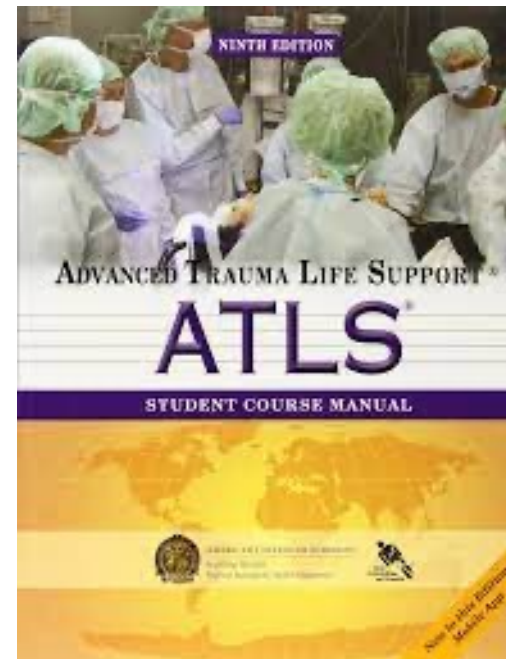
Oglesby et al. *Anaesthesia* 2022; 77: 527-537



- NHS litigation analysis
- 2008-2018
- 10,673 claims in total
- 1230 cases related to anaesthesia
 - £93 million in total (£75,000 per case)
 - No cases of spinal cord injury after tracheal intubation

History of MILS

- Popularised by ATLS in the 1980s despite lack of evidence
- Now included in numerous national guidelines and multiple textbooks



NICE Spinal Injury Guidelines

NICE Guideline NG41



1.1.2 At all stages of the assessment:

- protect the person's cervical spine with manual in-line spinal immobilisation, particularly during any airway intervention **and**
- avoid moving the remainder of the spine.

DAS Guidelines

Higgs et al. British Journal of Anaesthesia 2018; 120: 323-353



The risk of cervical movement is highest with facemask ventilation and securing the airway early with RSI is likely to be beneficial. RSI should be performed using manual-in-line stabilization with removal of at least the anterior part of the cervical collar to facilitate mouth opening, application of cricoid force and FONA.[326](#), [332](#),

AANS/CNS Guidelines

Theodore N et al. Neurosurgery 2013; 72: 22-34



SUMMARY

Spinal immobilization can reduce untoward movement of the cervical spine and can reduce the likelihood of neurological deterioration in patients with unstable cervical spinal injuries after trauma. Immobilization of the entire spinal column is necessary in these patients until a spinal cord injury (or multiple injuries) has been excluded or until appropriate treatment has been initiated. Although immobilization of the cervical spine after trauma is not supported by Class I or II medical evidence, this effective, time-tested practice is based on anatomic and mechanical considerations in an attempt to prevent spinal cord injury and is supported by years of cumulative trauma and triage clinical experience.

History of MILS

- Most of supporting evidence is empiric and in elective non-injured patients
- Generally favoured MILS on the basis that it was less harmful than:
 - Collars/Sandbags/Tape
 - Axial Traction
- No evidence of decreased incidence of spinal cord injury with MILS

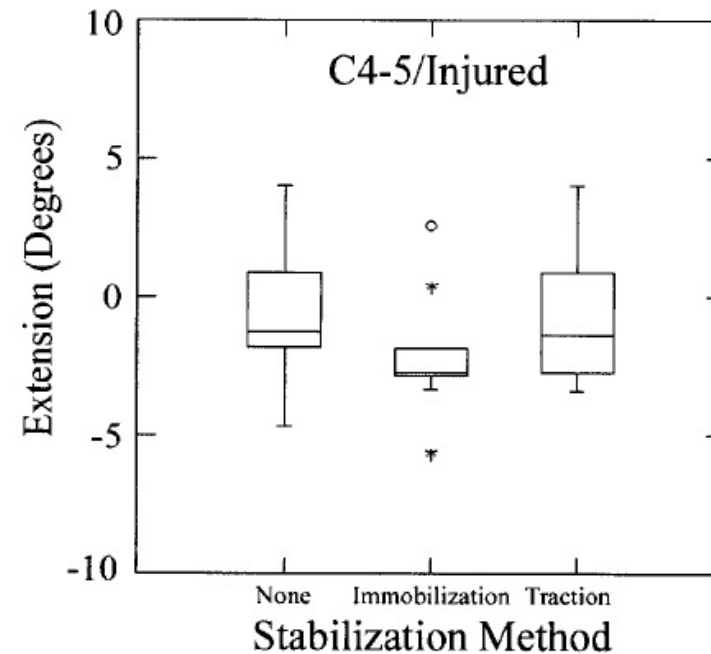


Efficacy of MILS

Lennardson et al. Journal of Neurosurgery 2000; 92: 201-6



“Neither manual in-line cervical immobilisation nor traction reduced motion at C4-5 in the presence of the posterior ligamentous injury”



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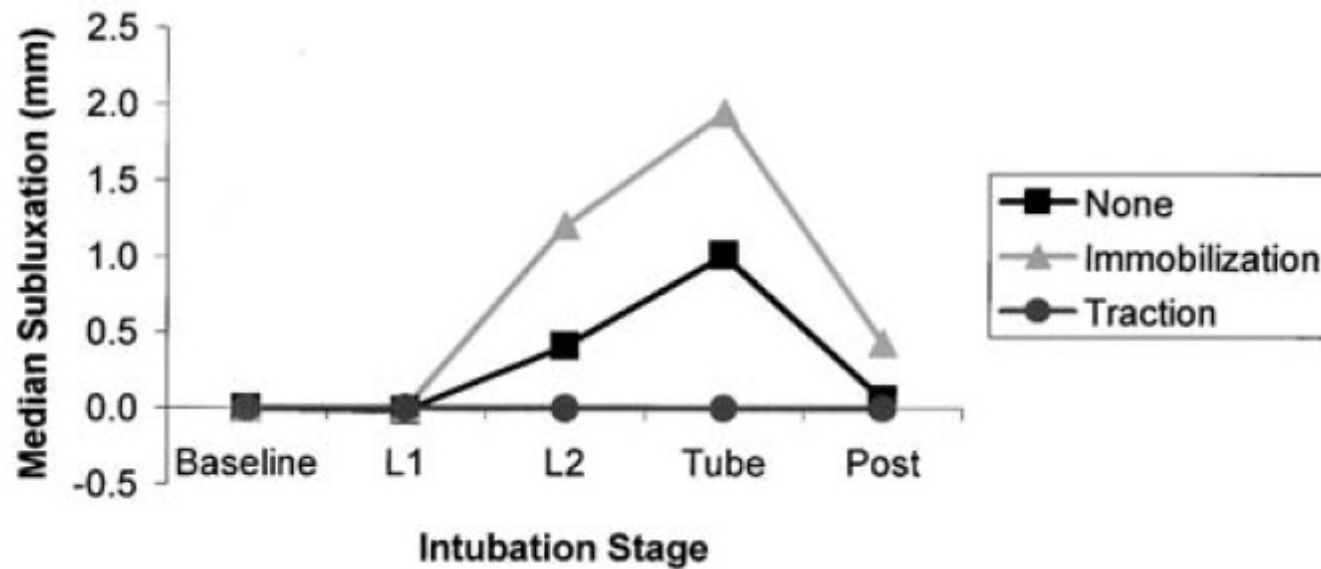
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Efficacy of MILS

Lennardson et al. Journal of Neurosurgery 2001; 94: 265-70



“Orotracheal intubation without stabilization caused less subluxation”



Efficacy of MILS

Brimacombe et al. *Anesthesia & Analgesia* 2000;91:1274–8



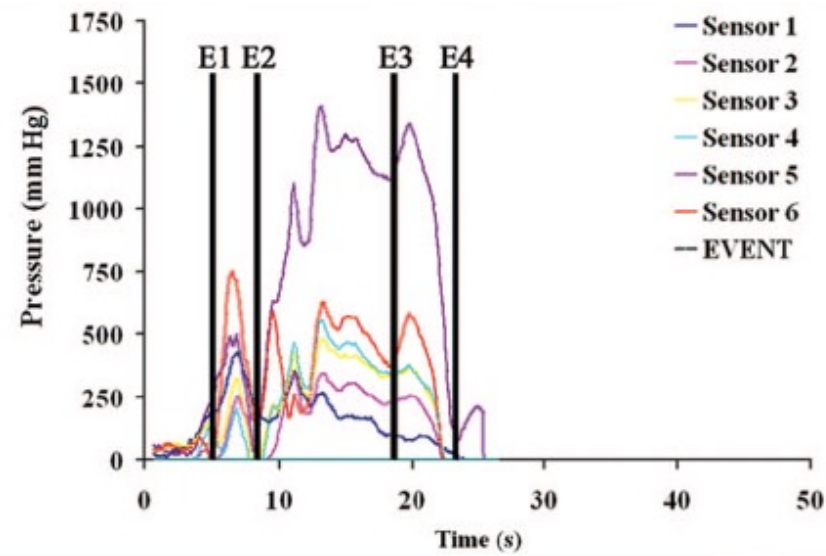
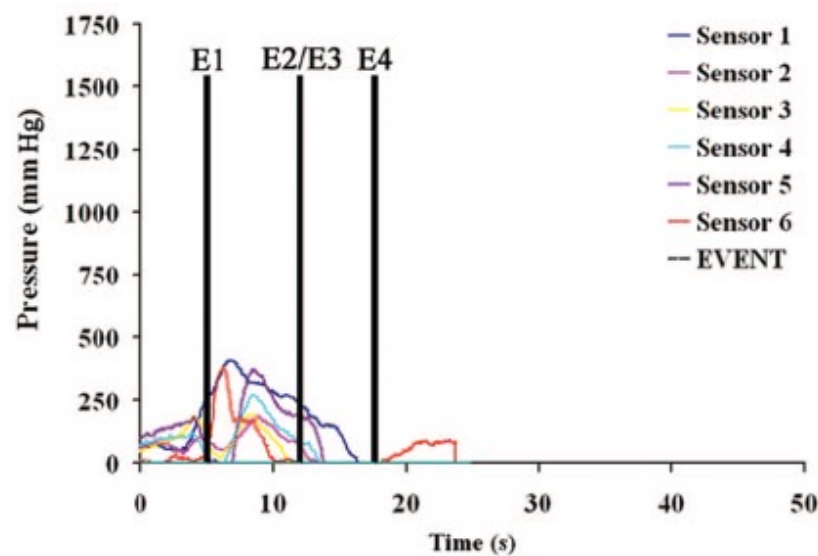
	Manual-in-line stabilization	Maximum displacement (mm)
Facemask and chin lift/jaw thrust	Yes	1.9 (1.2, -0.8–3.9)*
Laryngoscope-guided oral intubation	Yes	2.6 (1.6, -0.8–4.2)*
Fiberscope-guided nasal intubation	Yes	0.1 (0.7, -0.8–1.7)
Esophageal tracheal combitube insertion	Yes	3.2 (1.6, 0.2–6.2)*
Intubating laryngeal mask airway insertion/intubation	Yes	1.7 (1.3, -0.8–5.2)*
Laryngeal mask airway insertion	Yes	1.7 (1.3, -0.8–4.2)*
Maximum head-neck flexion	No	3.7 (1.9, -0.8–6.5)*
Maximum head-neck extension	No	1.8 (1.7, -1.3–5.2)*

Effect of MILS

BG Santoni et al. *Anesthesiology* 2009; 110: 24-31



MILS increases pressure applied during laryngoscopy (717 vs. 363 mmHg)



Manual in-line stabilisation

JP Nolan & ME Wilson; *Anaesthesia* 1993; 48: 630-33

- What is the effect of MILS on laryngeal view?
 - 157 patients
 - NMBA drugs used
 - Two experienced anaesthetists
 - Mac 3 blade

	Grade 1	Grade 2	Grade 3
Optimal Position	129 (82%)	26 (17%)	2 (1%)
MILS	75 (48%)	48 (31%)	34 (22%)



Manual in-line stabilisation

Heath; *Anaesthesia* 1994; 49: 843-45

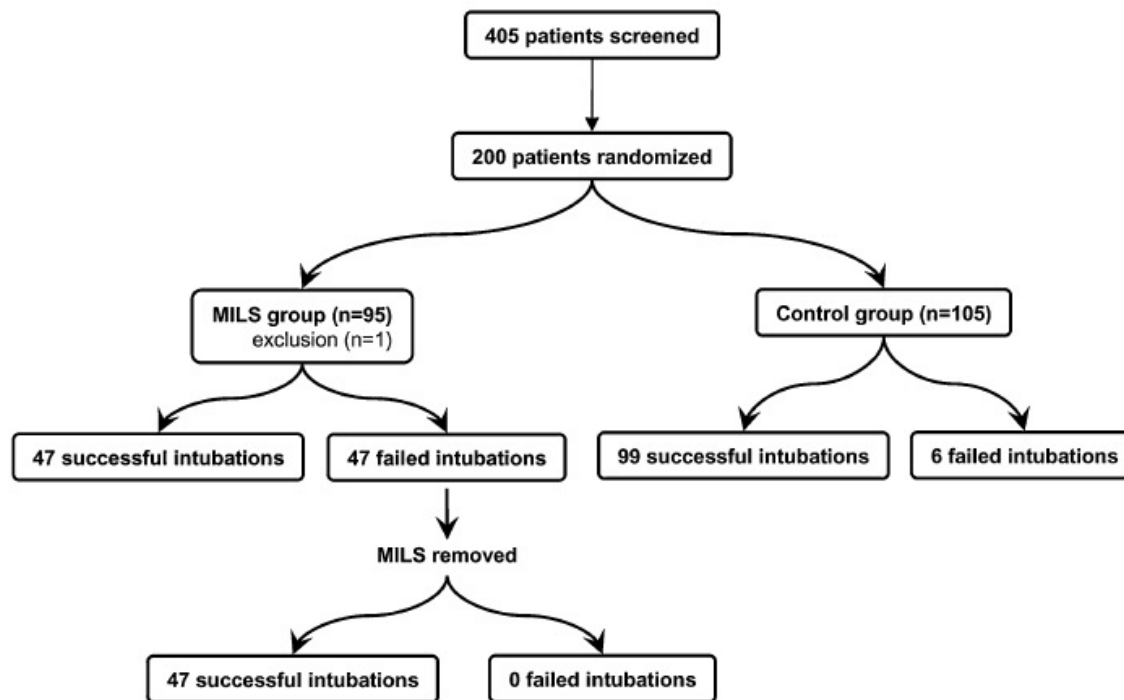


- What is the effect of MILS on laryngeal view?
 - 50 patients
 - NMBA drug used
 - Single experienced anaesthetist
 - Mac 3 blade

	Grade 1	Grade 2	Grade 3	Grade 4
Optimal Position	46 (92%)	4 (8%)	-	-
MILS	12 (24%)	27 (54%)	11 (22%)	-
Collar/Sandbags/Tape	2 (4%)	16 (32%)	25 (50%)	7 (14%)

Manual in-line stabilisation

Thiboutot et al; *Canadian Journal of Anesthesia* 2009; 56: 412-18



Manual in-line stabilisation

Thiboutot et al; *Canadian Journal of Anesthesia* 2009; 56: 412-18



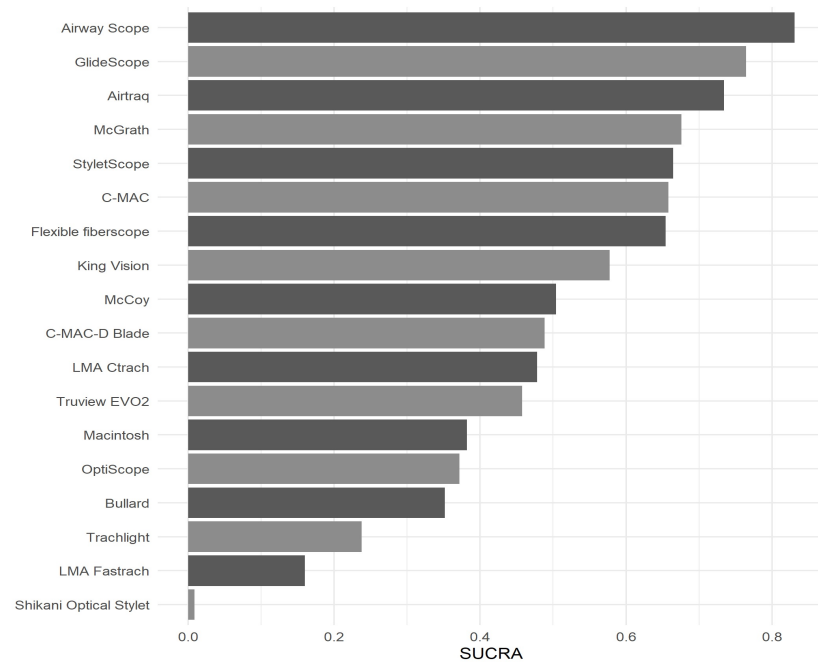
	Grade 1	Grade 2	Grade 3	Grade 4
Optimal position	77 (73%)	23 (22%)	5 (5%)	-
MILS	7 (7%)	32 (34%)	44 (47%)	11 (12%)

Videolaryngoscopy & MILS

Singleton et al. British Journal of Anaesthesia 2021; 126: 1055-66



- Meta-analysis of 48 studies
- Airway Scope was the only device to have a better probability of first-pass success compared with the Macintosh when MILS was used
- Only one study included trauma patients and 43/48 excluded patients predicted to be difficult



Summary of effects of MILS

MD Wiles. Anaesthesia 2021; 76: 850-53

- Worsens laryngeal view
- Increases likelihood of failed intubation
- Increase duration of intubation
- Increases force during laryngoscopy
- Minimal immobilisation of cervical spine
- May increase subluxation of injured spine
- Why does this practice continue?



Summary available here



- Worsens laryngeal view
- Increases likelihood of failed intubation
- Increase duration of intubation
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- Minimal immobilisation of cervical spine
- May increase subluxation of injured spine
- Why does this practice continue?