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EDITORIAL

Cervical spine injury and tracheal intubation: are we protecting patients or physicians?

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Cervical spine injury occurs in 3–4% of patients who suffer trauma, with approximately 25% of these individuals having associated cervical cord injury.[1] Spinal cord injury occurs more frequently in patients who have a lower Glasgow Coma Scale (GCS) and around 25% of patients will have suffered polytrauma with multisystem injuries.[1] As a result, this patient population often requires tracheal intubation for airway protection and to allow management of their injuries, either in the operating theatre or intensive care unit. In addition to this emergent patient cohort, patients at risk of cervical spine injury also present for elective surgery. The potential for cervical cord injury may be due to the surgical procedure itself (for example, cervical disc surgery) or pre-existing cervical canal stenosis, which is a common finding in older patients and may be asymptomatic.[2]

Due to the potentially devasting sequelae of worsening an existing neurological deficit or causing a new spinal cord injury, clinicians often have concerns regarding the safest technique for tracheal intubation. This is a contentious area, as despite the hypothesised risk of tracheal intubation causing primary or secondary cervical cord injury, there is a paucity of evidence to support this assertion.[3,4] There is no clear consensus in published guidelines as to what tracheal intubation technique is optimal in terms of protection of the cervical spinal cord, and many of the studies undertaken in this area were done before the widespread availability of videolaryngoscopes.

The study by Stegmann et al. in this issue of the journal provides useful data on contemporary clinical practice with regard to tracheal intubation in patients at risk of cervical cord injury.[5] The authors undertook an international survey of anaesthetic practitioners to determine the preferred approach for tracheal intubation for a hypothetical elective and emergent clinical vignette of a patient with cervical spinal instability. Responses were received from over 1 000 practitioners based in 101 countries. The majority of respondents had more than 10 years of clinical anaesthetic experience and worked in tertiary or quaternary institutions; however, only 17% of the cohort were medically qualified. In the emergent situation, there was a preference for videolaryngoscopy (47%) or awake fibreoptic intubation (AFOI) (40%), with only 11% of respondents opting for direct laryngoscopy. In the elective setting, there was a small increase in the number of respondents choosing videolaryngoscopy (51%), with preferences for AFOI and direct laryngoscopy slightly reduced at 37% and 9% respectively. The primary reason supporting the technique chosen by respondents was the need to minimise cervical spine movement. However, further analysis of the responses supplied provided some interesting insights, and suggested that some respondents were providing answers based upon perceptions of one technique being the "right" answer. For example, 26–28% of clinicians who stated that they did not have flexible bronchoscopes available in their institution still expressed a preference for AFOI, and 23–27% of clinicians without ready access to videolaryngoscopy opted for this technique. This suggests that the study results may not be reflective of actual clinical practice, but instead may be the techniques that practitioners believe to be more defensible in terms of protection from criticism and/or medicolegal claims.

In a similar survey of anaesthetic practitioners contacted via the American Society of Anesthesiologists, respondents favoured AFOI and then videolaryngoscopy for tracheal intubation of a haemodynamically stable patient with neurological symp-toms after cervical spine injury.[6] When the patient was haemodynamically unstable, videolaryngoscopy and direct laryngoscopy were favoured equally. A survey of Canadian intensive care physicians found that direct laryngoscopy was the preferred option for the intubation of the trachea of a patient who was critically ill and had cervical immobilisation in place.[7] These conflicting results reflect the lack of consensus regarding tracheal intubation in patients with actual or suspected cervical spine and/or cord injury. Videolaryngoscopy is becoming an increasingly popular technique, with a move towards this becoming the default technique for all tracheal intubations.[8] In one US centre, videolaryngoscopy is the most common technique for the tracheal intubation of patients with an unstable cervical spine, with AFOI now performed infrequently.[9] With the development of awake tracheal intubation techniques using videolaryngoscopy[10] this trend is likely to continue.

There is no clear superiority for any one tracheal intubation technique in terms of minimising the (undefined) risk of cervical cord injury. There are several reasons for this. First, the risk of tracheal intubation causing or worsening cervical cord injury is very small and historically this perceived risk has been exaggerated significantly.[4] Given this, no comparative study

of tracheal intubation technique is adequately powered to detect a difference in the incidence of subsequent neurological deterioration. Second, the majority of research studies focus on surrogate measurements of cervical spine movement, usually changes in external angulation. These measurements may not be reflective of changes in cervical spinal canal diameter, which is more accurately reflected by assessing changes in space available for the cord; unfortunately, this is measured infrequently. Third, the majority of studies have been done using healthy volunteers or, far more commonly, cadavers. The surgically created cadaveric models of instability involve the complete transection of the majority of supporting ligaments of the cervical spine, which is an injury that would normally be associated with a high immediate mortality rate in the real world. In addition, the practitioners who are intubating the trachea often target maximal glottic exposure at laryngoscopy, which does not reflect clinical practice where the aim is for minimal glottic exposure. The combination of these factors makes extrapolation of research studies to clinical practice almost impossible.

It is also worth remembering that the maximal insult to the spinal cord injury occurs at the time of traumatic injury and cannot be replicated during tracheal intubation. The force required to cause cervical fractures and ligament disruption ranges from 645–7 429 N (depending on the force vector).[11] In comparison, direct laryngoscopy applies a mean (SD) force of 49 (16) N and videolaryngoscopy 10 (3) N.[12] Movement within the cervical spine's normal range of motion requires very little force and is, therefore, unlikely to result in any energy transfer to the spinal cord; this is further attenuated by the absence of the focussing of force seen in trauma that occurs due to a wave effect.[13] The force applied during laryngoscopy is also only applied for a few seconds; animal models have suggested that > 30 min of cord compression is necessary to induce sustained spinal cord injury.[14] Given these factors, it would appear that clinicians should use the tracheal intubation technique with which they are most proficient and that is most likely to minimise cervical spine movement in their hands. Prolonged tracheal intubation using an unfamiliar or infrequently practised technique is only likely to result in a vulnerable, damaged spinal cord being exposed to further ischaemia.

The study by Stegmann et al.[5] also highlights the use of manual in-line stabilisation (MILS). This practice was first popularised in the 1980s when taught as part of Advanced Trauma Life Support (ATLS) courses and is recommended in a number of clinical guidelines.[15] This may explain why 86% of the survey respondents stated that they would use MILS during tracheal intubation. This again shows the difficulty in altering long-established clinical practice, even when there is clear evidence showing that MILS has a number of adverse effects including a worse laryngeal view,[16] increases the force applied during laryngoscopy and makes difficult, prolonged or failed tracheal intubation more probable.[17] Like other ATLS management principles,[18] the routine use of MILS has been challenged, especially given the lack of evidence demonstrating that it actually prevents cervical spine movement during laryngoscopy and tracheal intubation.[19] Indeed, the application of MILS may actually result in a greater degree of subluxation of injured cervical spine segments.[20]

The study by Stegmann et al. helps provide valuable insight into the management of a challenging clinical problem.[5] The study highlights a number of issues that should be addressed in future academic work. First, clinical guidelines and recommendations relating to tracheal intubation in patients with actual or potential cervical spine injury should reflect the paucity of relevant clinical research studies in this area and authors should be wary of recommending one particular approach. It is probable that there are a multitude of equally effective and safe approaches and that there is not a "correct" way to intubate the trachea. Second, there is a need for high-quality studies investigating tracheal intubation techniques in patient models that use clinically relevant measures (such as space available for cord) and modern videolaryngoscopes. Finally, we should regularly analyse precisely what determines our clinical practice: is this to provide the best care for our patients, to avoid criticism from colleagues or due to clinician concerns about the potential for medicolegal claims? These issues are similar to those relating to the use of cricoid force, which is primarily used to avoid medicolegal criticism as opposed to offering meaningful patient benefit.[21] The adage "we've always done it this way" risks the introduction of dogma into clinical practice and is likely to be a barrier to the delivery of evidence-based, patient-centred care.

Conflict of interest

MDW is on the editorial board of *Anaesthesia*.

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