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Airway assessment in the obstetric patient – are we there yet?

Difficult or failed tracheal intubation following induction of general anaesthesia in the obstetric patient is more frequent than in the non-obstetric population, and difficulties with airway management remain a major contributing factor to anaesthesia related maternal morbidity and mortality [1,2]. The ability to accurately predict a difficult airway could facilitate planning and preparation and predict a difficult airway. In addition, in obstetric practice, airway assessment is often hindered by the limited time available to assess the airway in an emergency. The need for antenatal anaesthetic assessment for women with a potential difficult airway is obvious [3]. But the question arises as to how does one predict a difficult airway? When used in isolation, bedside tests have poor predictive values. Despite being one of the more popular bedside tests, the original and modified Mallampati grading have low sensitivity (42–81%), specificity (53–89%) and positive predictive values (2–21%) [4]. In addition, Mallampati score is not consistent, as it may increase with advancing pregnancy and labour [5]. In the current issue, Jarraya A et al. [6] evaluate novel indicators for predicting difficult airway in obstetric patients. They found that Mallampati score (sensitivity 99%, specificity 64%), chest circumference-to-sternomental distance ratio (sensitivity – 80.6%, specificity – 70.5%), weight gain during pregnancy (sensitivity 71%, specificity – 83.9%) and neck circumference (sensitivity – 71%, specificity – 89%) were independently associated with difficult intubation. Previously, Honarmand et al. [7] conducted a similar study comparing Mallampati score, upper lip bite test and height to thyromental distance ratio. Only the height to thyromental distance ratio was a potentially useful screening test for difficult laryngoscopy, with a sensitivity of 71.4% and specificity of 98.1%. When bedside tests are used in combination, the chances of predicting a difficult airway increase [8–11]. The low predictive value of ‘established’ assessment methods is the driving force for constantly searching for better ones. This makes studies like Jarraya A et al. useful in their own right [6].

Yentis in 2002 wrote an editorial titled ‘Predicting difficult intubation – worthwhile exercise or pointless ritual?’, in which he challenged the process of airway assessment. He ended his editorial with a conclusion that although predicting difficult intubation is unlikely to be useful, it should still be carried out as it forces the anaesthetist to think about the airway [4]. Sixteen years later, a Cochrane review by Roth et al. also concluded that bedside tests are not suited for the purpose of detecting an unanticipated difficult airway, as they fail to detect a large proportion of difficult airways [12]. Perhaps the way forward for airway assessment is to approach it differently. Firstly, we need to define what is meant by a difficult airway, and secondly, we need to embrace new technology that may assist us in improving the positive predictive values of airway assessment.

1. What is a difficult airway?

When talking about a ‘difficult airway’, many usually equate this with a ‘difficult intubation’. However, difficult airway is a summative term that includes various factors including: the ability to ventilate with a facemask [13]; insert and ventilate with a supra-glottic airway device (SAD); obtain a good view at laryngoscopy and intubate the trachea; maintain subglottic patency of the airway; obtain front of neck access (FONA) and finally extubated safely [14]. Kinsella et al. highlighted that being conscious of these multiple aspects of the difficult airway will help better preparedness and flexibility [15]. This structured and thorough approach to airway assessment in obstetrics is not always possible, especially in time pressured situations with multiple distractions and factors which are out of the anaesthetist’s control. The Obstetric Anaesthetists’ Association (OAA) and Difficult Airway Society (DAS) have produced guidelines for the management of unanticipated difficult and failed tracheal intubation in obstetric patients [16]. These emphasise the importance of holistic airway assessment and planning with the team.

2. Use of modern technology in airway assessment

Since current airway assessment methods have failed to reduce the incidence of unanticipated difficult airway, perhaps it is time to explore newer technology and apply this to airway assessment. The use of ultrasound is gaining popularity in airway assessment. In 2003, Ezri used ultrasound to quantify pre-tracheal soft tissue in the neck. He concluded that patients whose laryngoscopy was difficult had more pre-tracheal soft tissue at the level of vocal cords, with a mean value of 28 mm [17]. Hui et al. [18] identified sublingual ultrasound visualisation of the hyoid bone in non-obstetric patients as a potentially useful airway assessment tool. Inability to identify the hyoid bone on ultrasound had higher sensitivity (70%) and specificity (97%) to predict a difficult intubation than the established bedside tests (Mallampati, mouth opening, thyromental distance and neck extension). Alternatively, the hyomental distance, measured by an experienced radiologist, was found to be a promising criterion for predicting difficult intubation [19]. It is obvious that all these new indicators will need clinical validation regardless of how promising the first reports appear.

The current guidelines in the UK [16] suggest early consideration of FONA in failed intubation scenarios. Skills of the procedure, including identification of the cricothyroid membrane, are usually acquired in the simulation setting. The cricothyroid membrane is not necessarily a superficial structure [20] and can be difficult to palpate especially in obese pregnant women. Identification of the

cricothyroid membrane in obese labouring women has been shown to be more accurate when ultrasound was used, compared to digital palpation [21]. A more recent study showed that ultrasound was 100% accurate in localising the cricoid cartilage, whereas there was a huge variation with landmark methods [22].

Another technology which is gaining interest is that of computerised analysis of facial structure. Preliminary studies have demonstrated that automated analysis of facial structure taken from photographs, combined with thyromental distance, outperforms current popular bedside predictive tests [23].

In the calmer setting of elective cases, anaesthetists have joined forces with other specialties including radiologists, head-and-neck, and ENT surgeons to investigate the airway. Assessing tracheal stenosis or compression with multi-slice two or three-dimensional CT or virtual bronchoscopy has been reported on numerous occasions in non-obstetric patients and obstetric patients [24,25]. Virtual endoscopy uses head and neck CT images to generate a 'fly-through' airway reconstruction using special software [26–28]. It represents a unique, non-invasive, safe and accurate airway assessment that warrants further exploration.

The Royal College of Anaesthetists audit standards recommend that all patients should have documented pre-operative airway assessment before having an anaesthetic. Documentation of airway assessment, vital for future anaesthetics, had been found to be lacking in about 40% of cases [29]. Some videolaryngoscopes allow recording of the laryngoscopy and intubation. Zaouter et al. suggested that all intubations with videolaryngoscopes should be recorded and added to the electronic patient records; recalling the record of a past intubation might become as standard as looking up the patient's laboratory results [30].

Adjuncts in airway management have come a long way with the introduction of SADs, videolaryngoscopes and high flow humidified nasal oxygen. However, airway assessment is still reliant on basic bedside tests that are essentially not better than 'eye-balling'. It is time that we concentrated more on prevention of failed airway management than dealing with the consequences. Perhaps in the future, the anaesthetist will be armed with a portable ultrasound machine rather than a stethoscope for the pre-operative assessment.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tacc.2018.12.001>.

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