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REVIEW ARTICLE

Video laryngoscopes and the obstetric airway

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ABSTRACT
The pitfalls surrounding securing the airway in the obstetric patient are well documented. From Tunstall's original failed intubation drill onwards, there has been progress both in recognition of the difficulties of airway management in the pregnant patient and development of algorithms to enhance patient safety. Current trends in obstetric anaesthesia have resulted in a significant decrease in exposure of anaesthetists, especially trainees, to caesarean section under general anaesthesia, compounding the difficulties in safely managing the airway. Video laryngoscopes have recently appeared in airway algorithms. They improve glottic visualisation and are useful in the management of the difficult non-obstetric airway, including those in morbidly obese patients and in the setting of a rapid-sequence induction. There is growing interest in the potential use of video laryngoscopes in the obstetric population and as a teaching tool to maximise training opportunities.

Introduction

Securing the airway of a pregnant woman in a safe and timely fashion remains a concern for obstetric anaesthetists. The difficult airway is, in any setting, the major cause of intubation-related morbidity and mortality. This is particularly pertinent in obstetrics where difficult and failed intubation are relatively common and not decreasing despite advances in airway management.[1] Complications of general anaesthesia remain a leading cause of pregnancy-related anaesthetic mortality in the UK[2] and USA[3] and have accounted for over 50% of anaesthetic-related deaths, many of them airway related.[4]

National guidelines on airway management[5–7] have undoubtedly led to a more systematic approach, but deaths from failure to intubate and ventilate, and following extubation, continue to occur. With the increasing use of neuraxial techniques, experience in general anaesthesia for the obstetric patient is decreasing. General anaesthesia is, however, still required when neuraxial blocks are contraindicated or ineffective and hence the concern regarding the potential for an increase in airway-related difficulties.[8,9]

Does the obstetric airway cause more problems?

Airway difficulty has been reported to be eight times more common in the obstetric compared to the general population.[10] Although it has been widely accepted that the obstetric airway causes more problems, three studies from large units suggest the incidence of difficult and failed intubation in obstetrics is similar to that in the general population.[11–13] The findings of these studies may be due to the increased appreciation of the problems associated with difficult intubation, better screening of high-risk women and the institution of early effective neuraxial blockade for those women predicted to have a difficult airway. These units may also have a greater availability of more senior staff and be performing a higher percentage of caesarean sections under general anaesthesia. Being large, tertiary referral centres, these units may also use new airway devices and implement the introduction and adherence to difficult intubation algorithms.[14]

Whether the obstetric airway is truly more difficult or not, failure to intubate continues to be a concern for the anaesthetist with the attendant implications for the mother, baby and, indeed, anaesthetist of not successfully managing the airway. Potential airway problems may be those specific to the patient or those related to the anaesthetic.

Patient factors

These are both anatomical and physiological. Women gain approximately 15–20 kg during pregnancy. This can be compounded by pre-existing obesity with all its well-documented challenges.[15] Breast enlargement during pregnancy may make placement of the laryngoscope difficult in the supine position. Full dentition is more likely and may cause problems if the maxillary incisors

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protrude. Fluid retention in the tissues of the head and neck during pregnancy potentially narrows the upper airway and reduces compliance making laryngoscopy more difficult;[16] and more acute airway changes may develop during labour and delivery.[17,18] Upward displacement of the diaphragm by the expanding uterus impinges on functional residual capacity especially in the supine position: the effect is more marked in the obese parturient. This significantly decreases the efficiency of pre-oxygenation, which, with the increased metabolic requirement for oxygen in pregnancy, speeds up the rate at which a pregnant woman desaturates during induction of general anaesthesia.[19] The risk of difficult intubation is further increased by the use of rapid-sequence induction to avoid regurgitation and aspiration of stomach contents.

Anaesthetic factors

Over the past 20 years, there has been a significant reduction in the number of general anaesthetics given for caesarean section.[20,21] Consequently, trainee anaesthetists have fewer opportunities to gain experience of general anaesthesia in the obstetric population.[22] Over 50% of general anaesthetic caesarean sections are emergency procedures occurring during the night[20] when there are often fewer medical staff available: these staff are likely to be less experienced with general anaesthesia in the obstetric patient. Indeed, approximately 80% of failed intubations occur in the hands of a junior trainee.[23] Similarly, anaesthetic support staff are also becoming less skilled due to declining rates of general anaesthesia. Furthermore, obstetric operating theatres are often remote from other theatres and may lack equipment for management of the difficult airway and staff experienced in its use.[24] The combination of these factors increases anxiety, leading to an inevitable deterioration in performance. Moreover, in the face of airway difficulty, non-adherence to protocols has been reported.[25]

Management of the difficult and failed intubation in obstetrics

In 1976, Tunstall presented the first obstetric failed intubation drill, with an emphasis on prevention of aspiration, maintenance of oxygenation and avoidance of repeated laryngoscopy.[26] He suggested that in cases where intubation was not possible the patient should be placed head down in the left lateral position with continuance of cricoid pressure. Oxygenation should be maintained via mask ventilation with the help of a Guedel airway and airway manoeuvres, including release of cricoid pressure, if needed. If oxygenation was possible via the mask, the stomach should be emptied with a wide bore nasogastric tube and magnesium trisilicate injected down the tube to reduce stomach acidity. He advocated that, all being well at this point, the caesarean section should proceed under inhalational mask anaesthesia. If oxygenation was difficult to achieve the patient should be woken up, the stomach emptied, magnesium trisilicate given and the patient given an inhalational mask anaesthetic from the beginning.

Harmer, in 1997, concluded that the deaths attributable to difficult or failed intubation in obstetrics were largely due to "poor organisation, poor judgement and failure to ensure maternal oxygenation."[27] As a response to this he outlined a comprehensive system of airway assessment, equipment required for intubation, optimal positioning and conduct of anaesthesia and a detailed algorithm for what to do in cases of difficulty. Harmer emphasised the efficacy of failed intubation drills and the need for a logical approach to airway problems to reduce maternal mortality and morbidity.

In spite of the major improvements in airway management, difficult and failed intubation remain major issues in obstetric anaesthesia and there is a constant drive towards improvement on difficult airway drills, and the incorporation of new airway technologies into the management of these scenarios. In 2004, the Difficult Airway Society (DAS) produced comprehensive guidelines on the management of difficult intubation, although the authors highlighted that these were not specific to obstetrics.[6] In the original version of these guidelines, direct laryngoscopy was the initial plan with no more than three attempts allowed using a bougie or alternative laryngoscope and optimal positioning.[6] The ASA has recently updated its thorough guidance of difficult airway management although again, without specific reference to obstetric anaesthesia.[5]

For the obstetric anaesthetist, one concern with current guidelines is that supraglottic airways play a major role in rescuing a difficult airway in the non-obstetric population. Although extremely useful, these may not be as effective in the obstetric patient because of the risk of a full stomach and the increase in airway pressures. Despite this, in a recent review of failed intubation in the UK, a supraglottic airway was used as a rescue device in 86% of cases.[1]

The lack of specific obstetric difficult airway guidelines is currently being addressed by a joint Obstetric Anaesthetists' Association (OAA)/DAS working party and, at the time of writing, an initial draft has been circulated for consultation.[28] As in previous airway guidelines, the use of an alternative laryngoscope is suggested following failure to intubate at the first attempt. With the increasing popularity of video laryngoscopes, it is possible that these will become the preferred alternative device.

Video laryngoscopes

Conventional laryngoscopes with a Macintosh blade are used to bring the oral, pharyngeal and tracheal axes into a straight line, enabling direct visualisation of the glottis

to achieve tracheal intubation. Using direct laryngoscopy, the operator has an angle of view of approximately 10–15 degrees. Successful visualisation and intubation with direct vision is straightforward in about 90% of cases, with 10% requiring adjuncts such as a bougie, stylet, an alternative laryngoscope or the use of fibreoptic intubation.

Since the advent of laryngoscopes there has been a constant drive towards optimisation of laryngoscopy to reduce the incidence of difficult and failed intubation by facilitation of glottic visualisation. Video laryngoscopes are the most recent development along this line. They consist of a laryngoscope with a high-resolution digital camera located near the tip of the blade and a method of relaying the image to a monitor so it can be viewed. The monitor may be separate from or incorporated into the laryngoscope itself. The advantage of the video laryngoscope is that it effectively puts the operator's eye two-thirds of the way down the laryngoscope blade. This means that visualisation of the glottis only requires alignment of the pharyngeal and laryngeal axes, which are already inclined at similar angles, making visualisation of the laryngeal inlet easier. It also increases the angle of view to about 60–80 degrees.

A number of different video laryngoscopes are currently available and new or upgraded devices have been launched at regular intervals over the last decade.[29] There are three main categories of video laryngoscopes.[30]

Macintosh blade-shaped optical laryngoscopes

These devices (e.g. Storz V-MAC and C-MAC (Karl Storz, Culver City, CA, USA) (Fig. 1), McGrath MAC (Aircraft Medical Edinburgh, Scotland) have blades shaped like a Macintosh laryngoscope but are combined with video technology. The video screen is helpful as anyone assisting with intubation is able to visualise the procedure and so target their actions accordingly. The camera is near the end of the blade giving a more distal and wider-angle view. The insertion method is similar to the conventional Macintosh laryngoscope, and it is possible to see the glottis either directly or on a video screen. Successful intubation is achieved more frequently when compared with the Macintosh laryngoscope,[31] but the use of a tube introducer and external pressure to the larynx is frequently required to obtain a clear view of the glottis.

Anatomically shaped blade without a tube guide

This group includes the Glidescope (Verathon Medical, Bothell, WA, USA) (Fig. 2), McGrath Series 5 (Aircraft Medical Edinburgh, Scotland), TruView Devices (Truphatek International Ltd, Netanya, Israel), Bullard laryngoscope, Storz D-blade (Karl Storz, Culver City, CA, USA) and AP Venner scope (Intravent Direct, Maidenhead, UK). The blade is anatomically shaped giving a view of the glottis without the need to flex or extend the neck. These laryngoscopes provide only an indirect view of the glottis and a pre-shaped stylet needs to be placed into the tracheal tube before intubation. A major limitation of this type of video laryngoscope is that, if the glottis is only seen indirectly, during tracheal tube insertion there is a moment when its tip cannot be seen. Upper airway, particularly pharyngeal, trauma may occur at this point.[32–35] In addition, because of the indirect visualisation of the glottis and the need for a pre-shaped stylet in the tracheal tube, there are occasions when even though there is a clear view of the laryngeal inlet on the video screen it can be difficult to direct a tube toward the glottis.

Fig. 1 C-MAC video laryngoscope

Anatomically shaped blade with a tube guide

Video laryngoscopes in this group, such as the Airtraq (Fannin, Dublin, Ireland) (Fig. 3) and Pentax-Airway Scope (AWS) (Ambu, Glen Burnie, MD, USA) have an anatomically shaped blade with a guiding channel that directs the tracheal tube towards the glottic opening. Because the tip of the tube is captured on the video screen even before insertion of the device, the location of the tube tip can be seen continuously during the course of tracheal intubation.

Use of video laryngoscopes in the non-obstetric population

Literature on the potential benefits of video laryngoscopy continues to increase at a dramatic rate. There have been many studies, systematic reviews and meta-analyses on its use in the non-obstetric population highlighting some of their advantages and disadvantages (Table 1).[29,36–38] These reviews have examined improvements in view at laryngoscopy, success of intubation at first attempt and the time taken to achieve intubation,

Fig. 2 Glidescope video laryngoscope

Fig. 3 Airtraq video laryngoscope

as well as complications of the technique. Subgroup analysis has looked at these outcomes in those considered to be difficult to intubate or where laryngoscopy has proved difficult or intubation has failed.

Video laryngoscopy leads to improved visualisation of the glottis with a greater proportion of Cormack and Lehane grade 1 or 2 scores when compared to a Macintosh blade.[36,39,40] Although a better view of the glottis is obviously desirable, it does not necessarily imply that intubation will be completed at the first attempt in a timely manner. Indeed, despite the improvement in Cormack and Lehane grade, this may not be translated into an overall reduction in the time to achieve intubation and, more importantly, significant improvements in successful intubation.[36,37] However, amongst inexperienced practitioners improved successful first attempt intubation and a reduction in time to intubation have been demonstrated when using video laryngoscopy.[37]

When focusing on patients considered to be at high risk of difficult laryngoscopy, video laryngoscopes may be of greater benefit.[29,31,40] Aziz et al. demonstrated an increased success rate of first attempt intubation from 84% using conventional laryngoscopy to 93% when using a C-MAC video laryngoscope in patients with a predicted difficult airway. In addition there was a reduced need to use a bougie or external laryngeal manipulation to achieve intubation.[31] However, it should be remembered that preoperative assessments of airway difficulty have a relatively low positive predictive value and the benefits of video laryngoscopy may only be realised when the operator is experienced with the technique.

There is evidence of the utility of video laryngoscopy as a rescue technique in difficult direct laryngoscopy.[29,30,40–42] Amongst 270 patients in whom direct laryngoscopy with a Macintosh blade had been difficult, Asai et al. were able to successfully intubate 268 using a Pentax AWS video laryngoscope.[40] Similarly, Piepho et al. using a C-MAC video laryngoscope, were able to intubate 49 out of 52 patients with unexpected Cormack and Lehane grade 3 laryngeal views on direct laryngoscopy.[41] Improvements have also been demonstrated with the Glidescope,[43] Airtraq[44] and the McGrath Series 5.[45] Again, it should be stressed that for successful intubation with video laryngoscopy, there is a need for proficiency.[30]

Video laryngoscopy affords a view of the glottis which is available to other members of the anaesthetic team enabling the assistant to help in a more focussed fashion.[42] Not only does this assist in the process of

Table 1 Advantages and disadvantages of video laryngoscopy

Advantages	Disadvantages
• Improvement in Cormack and Lehane grade 1–2 view • Improved success of intubation at first attempt in predicted difficult airways compared to conventional laryngoscopy • Reduced requirement for bougie or external laryngeal manipulation • Evidence of utility as a rescue technique in difficult direct laryngoscopy • Anaesthetic assistant can see view and so help in a more focussed fashion • Usefulness as a teaching tool • Advantageous in cervical spine pathology as reduced need to flex or extend neck and less force required reducing pressure on neck and mucosa • Need for less force to align axes so reduced risk of dental trauma • Increased rates of successful intubation amongst inexperienced practitioners	• Many different models, with different characteristics and requirements for positioning blade and optimisation manoeuvers • Increased rates of successful intubation only in those familiar with the technique • Learning curve to become familiar with the use of different types of equipment • Few data comparing efficacy and side effects of different models • Difficulty passing tracheal tube despite good view • Time to intubation may be longer • Adequate mouth opening required • Trauma to mucosa from styleted tubes • Lack of knowledge of all factors making video laryngoscopy difficult, although difficulty known to be associated with altered neck anatomy, previous surgery and radiotherapy

intubation, it also makes the technique useful as a teaching tool for novice anaesthetists and students.[46,47] The utility of the view being available to other members of the team during rapid-sequence induction has been investigated by Loughnan et al.[48] They showed that 41% of views were improved when the assistant applying cricoid pressure could see the screen: 45% were unchanged and 14% were initially worse. In addition, Goldmann et al. found that the use of a video laryngoscope during rapid-sequence induction not only improved the view but did not significantly increase time to intubation, suggesting that they can be used effectively and safely in this situation.[49]

Finally, because of the design of video laryngoscopes, there is no need to align the oral axis so less force is required to align the pharyngeal and laryngeal axes, resulting in less dental trauma,[50] and a reduced need to flex or extend the neck; an obvious advantage in cases with cervical spine trauma or reduced neck movement.[51,52]

Many different video laryngoscopes are currently available, all with slightly different characteristics and requirements for positioning of the blade and manoeuvers for optimising the view.[29] Currently, the anaesthetic literature contains relatively few comparative studies in humans demonstrating the superiority of one particular device over another in the rates of successful intubation. Teoh et al. compared the Pentax AWS with the Glidescope in 140 uncomplicated surgical patients. Use of the Pentax AWS resulted in shorter intubation times, more Cormack and Lehane grade-1 views, less difficulty with intubation and less trauma to the airway.[53] However, there was no significant difference in the number of successful intubations at the first attempt. In a similar study, Teoh compared the Pentax AWS with the C-MAC and Glidescope in 400 patients. The Pentax AWS again produced shorter intubation times, more Cormack and Lehane grade-1 views and less difficulty with intubation, although the C-MAC was significantly easier to insert.[54] There were no differences between the groups in the incidence of successful intubation at the first attempt. Maassen et al. compared the Glidescope, V-MAC and McGrath in 150 morbidly obese patients.[55] All video laryngoscopes provided a better view of the glottis than conventional laryngoscopy. Intubation with the V-MAC was significantly quicker and required fewer attempts.

As with all new equipment there is a learning curve to become proficient with the use of different types,[56] and although many anaesthetists find the use of video laryngoscopes intuitive there is no consensus on how many uses constitutes competence; indeed, this may vary from device to device.[57] Despite improvements in the view of the laryngeal inlet with video laryngoscopy, difficulty passing the tube into the trachea may result and the time to successful intubation may be prolonged.[42]

Although video laryngoscopes can make a difficult airway easier, the requirement for adequate mouth opening remains.[58] Furthermore, the presence of blood or secretions in the airway can obscure the view.[42] Mucosal trauma from video laryngoscopes, especially those requiring use of a styleted tube and a 'blind' moment when the tip of the tube is not visible, has been reported.[32–35] While there have been many studies on their use, there are few data about the efficacy of different video laryngoscopes compared with conventional direct laryngoscopy as to whether it is less traumatic or prolongs apnoea time.[42,29] Furthermore, it is unknown which factors make video laryngoscopy more useful in some patients compared to others,[42] although Aziz reported that altered neck anatomy, surgical scars, neck masses and previous radiation all adversely affected the usefulness of the Glidescope in intubation.[43]

A recent review of the use of video laryngoscopes in the non-obstetric population concluded that "the most convincing literature to date supports the use of video laryngoscopes in unanticipated, difficult or failed laryngoscopy. Several of these devices have a high intubation success rate in this clinical scenario".[30] However, it must be emphasised that experience and competence in their use is critical to their effectiveness in this situation.

Use of video laryngoscopes in the obstetric population

Compared with the experience of video laryngoscopy in the general population, that in the obstetric population is limited (Tables 2 and 3). Shonfeld et al. presented a case series of 27 patients who were intubated using a C-MAC video laryngoscope after direct laryngoscopy to compare the view.[59] All patients were successfully intubated and in no case did oxygen saturation fall below 94%. The authors concluded that video laryngoscopy can be used successfully in obstetric patients despite limited previous experience with the technique. It should be noted that 26 of the 27 patients in this report were graded as Cormack and Lehane 1 or 2 on direct laryngoscopy.

A study from the Turkish literature reported on 80 women undergoing elective caesarean section under general anaesthesia. They were randomised to undergo tracheal intubation using either a McGrath Series 5 video laryngoscope or with direct laryngoscopy using a Macintosh blade.[60] Of note, those women who were expected to be difficult to intubate were excluded. The authors found that intubation times were significantly longer with the video laryngoscope but that the percentage of cases in which the glottis was seen was higher. These are, however, only surrogate markers of the more relevant clinical outcome of successful intubation. The authors concluded that the McGrath Series 5 laryngoscope gave excellent glottic views in their obstetric population with normal airways.

Aziz et al. performed a retrospective study of the performance of the Glidescope in an obstetric unit where 180 patients were intubated over a three-year period.[61] All the cases were managed with direct- or video laryngoscopy. The use of direct laryngoscopy resulted in 157 of 163 first-attempt successful intubations. Video laryngoscopy gave 18 out of 18 successful intubations on first attempt. One failed direct laryngoscopy was rescued with a video laryngoscope. Sixteen patients in whom video laryngoscopy was used were predicted to have a difficult airway. The authors concluded that the use of video laryngoscopy can be a useful adjunct in the management of the obstetric airway and that its role in the difficult airway scenario warranted further study.

Eleven cases of the use of video laryngoscopy in difficult intubation in obstetric patients have also been described (Table 3).[62–69] Initial reports highlighted the benefits of video laryngoscopy when conventional techniques had proved unsuccessful.[62–65] In more recent publications, successful intubation has been reported using video laryngoscopy as the first choice technique in patients with predicted difficult airways.[66,67,69] In addition there is also a case series in which video laryngoscopy was used successfully for awake intubation in two patients after airway topicalisation with local

Table 2 Studies of video laryngoscopy in obstetric anaesthesia

	Study design	n	Findings	Authors' Comments
Shonfeld[59]	Observational Storz C-MAC	27	All women successfully intubated with no oxygen desaturation <94% 26/27 patients Cormack and Lehane grade 1–2 on direct laryngoscopy	Video laryngoscopy can be used successfully in obstetrics by anaesthetists with limited experience of the technique
Arici[60]	RCT of McGrath Series 5 vs. Macintosh laryngoscope	80	McGrath Series 5 resulted in: Longer time to intubation (P <0.01) Better view of glottic opening (P <0.002)	McGrath Series 5 provided excellent views during tracheal intubation in elective obstetric anaesthesia in patients with normal airways
Aziz[61]	Observational Glidescope	180	Direct laryngoscopy: 157/163 success at first attempt Glidescope: 18/18 success at first attempt One failed direct laryngoscopy was rescued with Glidescope 16/18 Glidescope patients were predicted to have a difficult airway	Video laryngoscopy may be a useful adjunct for obstetric airway management; its role in difficult airways should be studied further

anaesthetic. This was performed in the context of major postpartum haemorrhage and haemodynamic instability.[68] Of note, in the 2008–2010 UK survey of failed intubation, video laryngoscopes were not used in the management of any of the 57 cases reported.[1]

The role of video laryngoscopy in obstetric anaesthesia

Although there is relatively little obstetric-specific evidence as to the utility of video laryngoscopes in the pregnant population, common sense and extrapolation from the non-obstetric population, especially the work done in the morbidly obese,[55,70] would suggest it is a useful additional skill in our armamentarium. Despite the relative lack of literature, there is much interest in the use of video laryngoscopy in obstetrics, and those who have used it in this setting advocate its wider use. An OAA survey of all the lead obstetric anaesthetists in the UK showed that, of the 58% who responded, 90% have video laryngoscopes available on their difficult airway trolleys.[71] The two most popular video laryngoscopes in this survey were the Airtraq, available in 52% of units, and the Glidescope, available in 28%.

There is currently insufficient evidence to change practice and use video laryngoscopy for all obstetric general anaesthetic cases. However, for those patients with predicted difficult airways and as a rescue device as part of a failed intubation drill, the picture is less clear. Given the poor predictive value of pre-operative airway assessment techniques, it is possible that many obstetric patients will be anticipated to be difficult and therefore undergo video- as opposed to direct laryngoscopy. Whether this will improve outcome, or introduce other complications is a matter for speculation. As many obstetric anaesthetists lack experience of video laryngoscopy, it seems unlikely that for the time being video laryngoscopes should be recommended for use in those with predicted difficult airways. The decision to use a video laryngoscope when faced with a potentially difficult airway remains an individual decision based on personal experience with the technique.

Perhaps the most interesting scenario is that of rescuing a difficult or failed intubation. Currently, guidelines recommend the use of an alternative device and here the video laryngoscope may have an important role. However, as stressed previously, the technique is more likely to be successful in the hands of those who have sufficient previous experience to be deemed competent. Many obstetric anaesthetists are, however, relatively inexperienced in the use of video laryngoscopy, and gaining sufficient competence to use the technique when faced with a difficult airway is likely to be challenging if training is confined to the maternity unit. Establishing how much experience is necessary to become competent with video laryngoscopy is again unclear and it is unlikely that

Table 3 Case reports of video laryngoscopy in obstetric anaesthesia

	Video laryngoscope	n	Description	Authors' comments
Dhonneur[62]	Airtraq	2	Two morbidly obese patients successfully intubated using the Airtraq after failure using direct laryngoscopy	Airtraq first choice of alternative intubation device with consideration as a primary device in emergency caesarean section in women with predicted difficult airway
Turkstra[63]	Glidescope	2	Two women successfully intubated using Glidescope after difficult direct laryngoscopy	Glidescope either a primary device or first alternative in the parturient
Browning[64]	Pentax AWS	1	Successful intubation of obese parturient with Pentax AWS following grade 4 direct laryngoscopy	Video laryngoscopy useful in morbidly obese; should be a core skill for obstetric anaesthetists, who should be familiar with use in elective setting before use in an emergency
Mustapha[65]	Airtraq	1	Successful intubation of a woman with syringomyelia and Arnold-Chiari malformation following grade 4 direct laryngoscopy	Airtraq should be considered second line device in difficult intubation after failed direct laryngoscopy
Ni[66]	Airtraq	1	Successful intubation in patient for emergency caesarean section with predicted difficult airway	Airtraq may be used as first choice in patients with a potentially difficult airway
Tonidandel[67]	Glidescope	1	Patient with BMI of 61.4 kg/m^2 and difficult airway successfully intubated with Glidescope	General anaesthesia best avoided in morbidly obese; new airway tools may lead to successful intubation.
Kariya[68]	Pentax AWS	2	Successful awake intubation after major postpartum haemorrhage resulted in haemodynamic instability	Airway scope useful for anaesthetic procedures in the parturient who has haemodynamic instability
Dinges[69]	Glidescope	1	Failed awake fibreoptic intubation in a patient with osteogenesis imperfect; converted to general anaesthesia with successful intubation using Glidescope	Successful use of Glidescope (Cormack and Lehane grade 3 view) despite short thyromental distance and reduced cervical spine mobility

this can be achieved purely in obstetrics. Consequently, there is a place for seeking experience outside the maternity setting both for senior and trainee anaesthetists. Given the utility of video laryngoscopes as a teaching tool, with other members of the team able to see the image of the glottis, they have a potential role in training not only anaesthetists but also anaesthetic assistants.

Finally, there are currently no comparative studies of which video laryngoscope is most appropriate for use in the obstetric population. The choice made by most units is currently based on cost, compatibility with equipment elsewhere in the hospital and experience of senior members of staff within each unit.

Conclusions

Despite decreasing use, general anaesthesia is still necessary in obstetric anaesthesia and so problems with airway management will continue to occur. The use of guidelines and algorithms is established and evidence of benefit is well documented. Consequently, every unit should have a well-publicised airway algorithm for the management of the unanticipated difficult airway. Evidence-based guidelines on the management of difficult and failed intubation in obstetrics are currently in preparation and will be most welcome. It is likely that video laryngoscopes will come increasingly to the forefront of alternative laryngoscopes in difficult and failed intubation drills and they are already available in many obstetric units. Therefore all anaesthetists should become familiar with their use.

Video laryngoscopes provide effective glottic visualisation and allow intubation in patients with difficult direct laryngoscopy, even in the setting of rapid-sequence induction. They also facilitate training and allow assistance to be given in a focussed fashion as the whole team can see the view. However, there are reports of pharyngeal trauma associated with their use, the possibility that intubation may take longer and uncertainty about what constitutes adequate training. Currently, there is no evidence to recommend one of the many available video laryngoscopes over another in the obstetric population.

Nothing will be the answer to every difficult airway. To reduce the morbidity and mortality associated with difficulty and failure to intubate, training and competence in the use of both conventional and alternative devices will permit greater confidence with the use of alternative devices. This needs to be combined with thorough airway assessment, adequate pre-oxygenation, good positioning, antacid prophylaxis, training of staff, planning management of the parturient with a predicted difficult airway, creative training of junior and senior anaesthetists using simulation and airway drills and adequate senior supervision of all general anaesthetics in obstetrics.

Disclosure

The authors have no conflicts of interest to declare.

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